

RAILROAD GAZETTE

QUARTO VOL. XXIV.—NO. 5 A JOURNAL OF TRANSPORTATION, ENGINEERING AND RAILROAD NEWS. THIRTY-SEVENTH YEAR.

NEW YORK: Published at
73 Broadway.

FRIDAY, JANUARY 29, 1892.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS MAIL MATTER OF THE SECOND CLASS.

\$4.20 PER YEAR TO U. S. AND CANADA.
6.05 " " FOREIGN COUNTRIES.

Brown Brothers & Co.,
PHILA. NEW YORK. BOSTON.
ALEX. BROWN & SONS, BALTIMORE

CONNECTED BY PRIVATE WIRES.
Members N. Y., Phila. and Baltimore Stock Exchs.

We buy and sell all first-class
Investment Securities for cus-
tomers. We receive accounts of
Banks, Bankers, Corporations,
Firms, and Individuals, on fa-
vorable terms, and make collec-
tion of drafts drawn abroad on all points in the
United States and Canada, and of drafts drawn in
the United States on foreign countries.

Letters of
Credit.
We also buy and sell Bills of Ex-
change on, and make cable transfers
to all points. Also make collections
and issue Commercial and Travelers'
Credits available in all parts of the
world.

BROWN, SHIPLEY & CO., LONDON.

SEE ADVERTISEMENT, PAGE III.

BLOCK SIGNALS. INTERLOCKING

AND
RAILROAD SAFETY APPLIANCES.

THE
BETHLEHEM IRON COMPANY,

80 Broadway, New York.

STEEL RAILS.

F. G. GORHAM, Sales Agent.

PRINCIPAL OFFICE AND WORKS:

SOUTH BETHLEHEM, PA.

WM. BARCLAY PARSONS,

M. AM. SOC. C. E.,
CIVIL ENGINEER.

35 Broadway, New York.

Bradford L. Gilbert

ARCHITECT,
TOWER BLDG., 50 Broadway, N. Y. City.

Specialty: Railroad Stations.

BOOKS Mowbray's Pocket Book, 22,
Spon's Engineer's Tables, 40c.
Catalogues free. E. & F. N. SPON
& CO., 12 Cornhill St., N. Y.

Steel Rails and Railway Track Material.

HUMPHREYS & SAYCE,
10 WALL STREET, NEW YORK.

A. S. WHITON, No. 115 Broadway,
NEW YORK.

STEEL RAILS. Old Rails and Railway Supplies.
Contracts made for delivery in U. S., West India,
South America or F. O. R. English Ports.

THE UNION SWITCH & SIGNAL CO.

Office and Works: SWISSVALE (near Pittsburgh), Pa., U. S. A.

Sole Manufacturers of the Westinghouse Pneumatic Interlocking and Automatic Block Signal
Systems, Automatic Electric Signals and Electric Locking of Interlocking Levers.

Interlocking and Signaling Appliances for Railway Junctions, Crossings, Terminals
and Block Stations. Special appliances for the Protection of Drawbridges, Frogs, Crossings,
Switches and Switch Stands. Westinghouse Double-Acting Friction Buffer Drawgear.

Boston Office: New York Office: Chicago Office:
620 Atlantic Avenue. Times Building. Home Insurance Building.
E. H. Goodman, Pres. and Gen. Man. GEO. H. PAINE,
James Johnson, Secretary and Treasurer. Genl. Agent.

THE ROBERT W. HUNT & CO.

BUREAU OF INSPECTION, TESTS AND CONSULTATION

NOS. 631 and 633 THE HOOKERY, CHICAGO, ILL.

BRANCH OFFICES: NO. 80 BROADWAY, NEW YORK.
HAMILTON BUILDING, PITTSBURGH, PA. 328 CHESTNUT STREET, PHILADELPHIA.

ROBERT W. HUNT, M. Am. Soc. C. E., M. Am. Inst. M. E., M. Am. Soc. M. E., Late Gen.
Supt. Troy Steel & Iron Co.

JOHN J. CONE, Engineer of Tests. G. W. G. FERRIS, C. E.
A. W. FIEBO, Inspecting Engineer. JAMES C. HALLSTED, C. E.

Inspection of Rail, Fish Plates, Cars and other Railway Material. Chemical and Physical
Laboratories. Analysis of Ores, Irons, Steels and Oils. Consultation on Iron and Steel
Metallurgy and Construction. Northwestern Agents for Richle Bros.' Testing Machines.

REGINALD CANNING & CO.,

RAILWAY EQUIPMENT,

115 BROADWAY, NEW YORK.

We have in stock, and for sale for Cash or on Car Trust Plan, Locomotives, Passenger Combination
and Freight Cars of every description. Send for circulars and photographs.
Correspondence solicited. See issue May 8th, page xi.

ST. LOUIS.

BLACKMER & POST,

MANUFACTURERS OF
SUPERIOR VITRIFIED SALT-GLAZED

STANDARD SEWER PIPE

—AND—
Double Strength Culvert Pipe,

IN TWO AND ONE-HALF FOOT SECTIONS WITH IMPROVED JOINTS

—FOR—
RAILROAD CULVERTS & WATER WORKS CONDUITS

WRITE FOR PAMPHLET, "SOMETHING ABOUT CULVERT PIPE."

BLACKMER & POST,

ST. LOUIS.

Interlocking Switch and Signal Apparatus. Semaphore Block and Station Signals.
Frogs and Crossings. Switches and Switch Stands.

ALLENTOWN ROLLING MILLS,
Switch and Signal Dept., FRED'K S. GUERBER, Mgr't. Office and Works, ALLENTOWN, PA.

SIGNALING

INTERLOCKING

JAMES IRVINE, President.

GEO. B. F. COOPER, Vice-President.

WM. V. CAROLIN, Secretary and Treasurer.

NEW YORK EQUIPMENT COMPANY

15 WALL STREET, NEW YORK.

LOCOMOTIVES, PASSENGER AND FREIGHT CARS, ETC.

Have For Sale, for Cash or Lease on Easy Terms on the Car-Trust Plan,
of both Standard and Narrow Gauge, to Railroad Companies, Logging Railroads, Mining Companies, Contractors, etc.

WE HAVE READY FOR IMMEDIATE DELIVERY, IN PERFECT ORDER,

Six standard-gauge locomotives, and a large number of 20 and 25-ton coal and flat cars.

CHAS. R. JOHNSON,
Pres't. and Gen. Man.

HENRY JOHNSON,
Mgr. of Works and Treas.

D. W. PHELAN,
Secretary.

THE JOHNSON RAILROAD SIGNAL CO.,

Designers and Manufacturers of

Railroad Signaling Appliances,

INTERLOCKING and BLOCK SIGNALS.

Plans and bids submitted for interlocking Grade Crossings, Junctions, Yards,
Terminals, Passing Stations, etc.

DISTANT SWITCH SIGNALS.

ELECTRIC REPEATERS.

TORPEDO ATTACHMENTS.

Works and Main Office, **RAHWAY, N. J.**

New York Office, **47 BROADWAY.**

ALBERT LUCIUS,
CIVIL AND MECHANICAL ENGINEER.

71 Broadway, N. Y. All kinds of Engineering
Structures, Plans, Specifications, Estimates,
Superintendence, Bridge Inspection & Reports.

George P. Whittlesey, Railroad Inventions
a specialty.
Late Examiner U. S. Patent Off.
Atlantic Building. WASHINGTON, D. C., U. S. A.

PITTSBURGH TESTING LABORATORY.

HUNT & CLAPP, 95 Fifth Ave., Pittsburgh, Pa.

METALLURGICAL ENGINEERS AND CHEMISTS.

Specialties: Inspection of rails and of material for bridges and other structures. Chem-
ical analyses and physical tests of all kinds. Agency for Timm Olsen & Co.'s testing
machines and Tacher's Slide Rule. Slide rules kept constantly in stock. Price, \$30.00.

LOCOMOTIVE POP VALVES

THE ASHTON VALVES THE MOST EFFICIENT VALVES MADE.

THE ASHTON VALVE CO. 271 Franklin St., - BOSTON
218 Lake St., - CHICAGO
107 Liberty St., - NEW YORK

WILSON BROTHERS & CO.,
Civil Engineers and Architects,

DREXEL BUILDING, PHILADELPHIA, PA.

Surveys made for Railway Lines.
Plans and Specifications furnished for Buildings,
Bridges, Water Works, Sewerage Systems, Harbor
Improvements and all classes of Engineering and
Architectural Work.

Construction of Work Attended To.
Examinations made of Railway, Mining and Other
Properties.

STEEL RAILS AND

RAILWAY EQUIPMENT

O. W. CHILDS & CO., 115 N. Y., N. Y.

R. MUSHET'S

"SPECIAL" AND "TITANIC"

STEELS.

Sole Representatives in the United States,
B. M. JONES & CO.,
Nos. 11 & 13 Oliver St., BOSTON.
No. 142 Liberty St., NEW YORK.

F. W. DEVOE & CO.'S COLORS AND VARNISHES ARE STANDARDS



No. 121 "ACME" CHANDELIER, With Electric Fixtures.

THE ADAMS & WESTLAKE CO.,

MANUFACTURERS OF

Car Lamps, Lanterns, Headlights, Signals,
Switch and Train Tail Lights, etc.,

ALSO A COMPLETE LINE OF

Interior Car Trimmings,
Switch Locks,
Car Seats, etc., etc.

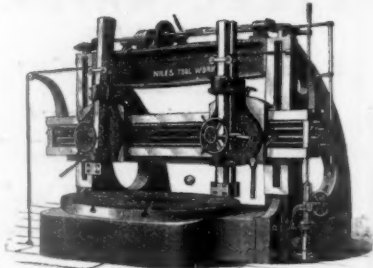
THE ADAMS & WESTLAKE CO.,

CHICAGO, ILL.

NILES TOOL WORKS, HAMILTON, O.

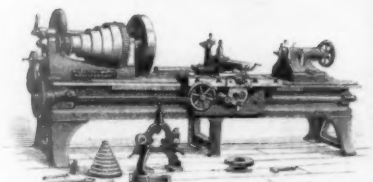
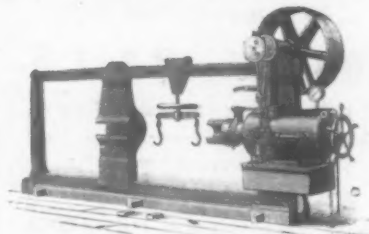
MACHINE TOOLS.

RAILROAD, CAR, LOCOMOTIVE AND MACHINE SHOPS
FURNISHED WITH COMPLETE EQUIPMENT.

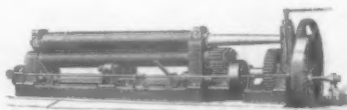


Driving wheel Lathes,
Screw-cutting Engine Lathes,
Single and Double Axle Lathes,
Hydrostatic Wheel Presses,
Planers,
Special Switch and Frog Planers,
Shaping Machines,
Boring and Turning Mills,
Horizontal Boring and Drilling Machines,
Vertical Drills,
Multiple Drills,
Arch-bar Drills,
Pulley Machines,

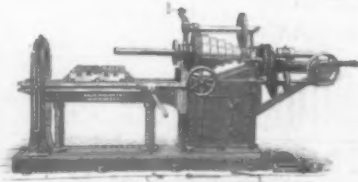
Car-wheel Lathes,
Heavy Forge Lathes,
Car-wheel Boring Machines,
Screw Machines,
Plate Planers,
Slotting Machines,
Cylinder Boring Machines,
Universal Radial Drills,
Car-wheel Drills,
Rail Drills,
Power-bending Rolls,
Plate-straightening Machines
Etc., etc.



CHICAGO,
Phoenix Bldg.
PITTSBURGH,
Lewis Block.



NEW YORK,
136 & 138 Liberty St.
PHILADELPHIA,
705 Arch St.



GEORGE M. BOGUE, President.

M. B. MILLS, Vice-President.

O. A. BOGUE, Sec'y and Treas.

MILLS RAILROAD GATE.

Of the Roads extensively using
our Gates, we refer you to the
Chicago & Northwestern,
Chicago & Great Western,
Chicago, Burlington &
Quincy, Chicago & West-
ern Indiana, Chicago, Pitts-
burg & St. Louis, Illinois
Central, Chicago & Grand
Trunk of Chicago, Union
Pacific, Denver & Rio
Grande, Denver, Texas &
Ft. Worth of Denver, Colo.,
Delaware & Hudson Canal
Co., of Albany, N. Y.



CORRESPONDENCE SOLICITED

In requesting the price for the
protection of Crossings, please
give us diagram of street cross-
ing, showing distance of street
bed from curb to curb, width of
side-walk and distance of run
from post to post across tracks.
We carry a stock on hand, and
can fill all orders promptly.

Manufacturers of AIR, LEVER
and CABLE GATES for RAIL
ROAD CROSSINGS.

BOGUE & MILLS MANUFACTURING COMPANY,
Office and Factory 31 and 33 East Indiana Street, Chicago.



10 WALL ST., NEW YORK
237 FRANKLIN ST., BOSTON
719 PHOENIX BUILDING, CHICAGO

FRANK S. LAYNG, CHAIRMAN.

C. R. KEARNS, SECRETARY AND TREAS.

PICKERING SPRING CO., Limited

MANUFACTURERS OF

Railway Springs of Every Description

PHILADELPHIA

WORTHINGTON STEAM PUMPS

HENRY R. WORTHINGTON,
NEW YORK

SEND FOR CATALOGUE

Boston
St. Louis

Philadelphia
St. Paul

Chicago

THE THOMSON-HOUSTON SYSTEM

—OF—

ELECTRIC TRAMWAYS

The Only System in Successful and
Economical Operation.

Send for S 32, a New Catalogue on Electric Tramways.

THOMSON-HOUSTON MOTOR COMPANY,
620 ATLANTIC AVE., BOSTON, MASS.

R. CARMAN COMBES,
President.

THOS. J. SWIFT,
Managing Director.

J. W. LATTIG,
Gen'l Supt. and Treas.

H. S. PFEIL,
Gen'l Agt. and Sig. Engr.

NATIONAL SWITCH & SIGNAL COMPANY

Office and Works: EASTON, PENNA.

—DESIGNERS AND MANUFACTURERS OF—

RAILROAD SAFETY APPLIANCES.

Mechanical and Electrical Interlocking, Electric Block Signals
and Distant Switch Signals.

PLANS MADE AND BIDS SUBMITTED FOR INTERLOCKING TERMINALS, YARDS, JUNCTIONS, GRADE CROSSINGS, DRAW-
BRIDGES, PASSING STATIONS, etc.

SPECIAL APPLIANCES:

Koyls' Parabolic Illuminated Semaphore,

National Torpedo Machine,

M. & S. Double-Wire Compensator,

National Selector,

Adjustable Clamp Pipe Lug.

New York Office: 41 Pine St. Southern Agent: J. A. CHISHOLM, Savannah Ga.

WESTERN UNION TELEGRAPH OFFICE AT THE WORKS.

AIR BRAKES.

The New York Air Brake Co. has taken more orders for car equipment in the last three months than the Westinghouse Company received in the first three years after bringing out their new freight car brakes.

The New York Air Brake is Sixty Dollars cheaper per engine, Twenty Dollars cheaper per passenger car, and Five Dollars cheaper per freight car than the Westinghouse, thus effecting a saving of 12 1-2 to 25 per cent. in price, which amounts to thousands of dollars saving to the Railroad Companies. This saving does not mean a poorer brake, for the pump, engineer's valve and other parts are acknowledged to be superior to the Westinghouse, and are being ordered to replace them on many roads, quite outside of large orders for new equipment. Careful personal investigation of our brake by practical railroad men has resulted in large orders, thus substantiating our claims.

We should be happy to see railroad men at our Works in Watertown to show them the operation of our brake on a fifty car train, both by itself and in combination with the Westinghouse equipment; and an inspection of our Works turning out one hundred car brakes per day would also prove interesting.

THE NEW YORK AIR BRAKE CO.,

115 BROADWAY, NEW YORK CITY.

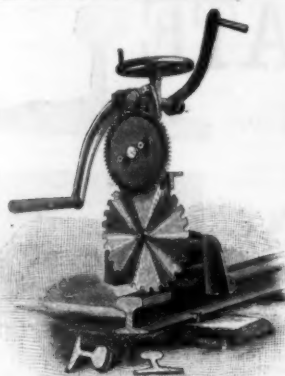
ROYAL C. VILAS, President.

JOHN C. THOMPSON, Secretary and Treasurer.

CHAS. A. STARBUCK, Vice-President.

A. P. MASSEY, Mechanical Engineer.

THE CINCINNATI CORRUGATING COMPANY, PIQUA, O.



BRYANT'S PORTABLE RAIL SAW.

Guaranteed to Cut ANY Rail from 90
degrees to 45 degrees.

BRYANT & BARBEY,

79 MILK ST., BOSTON.



Portable Railroad Drill.

ALSO USEFUL FOR

Bridge Builders.
Cable Road Builders,
Structural Iron Workers.

SAVES TIME AND LABOR.

Write for circulars and full information.

FRANK REED,

19 Hermon St., Worcester, Mass.

BRYANT & BARBEY, New England Agents
79 Milk St., Boston.

RAILROAD GAZETTE DIRECTORY: CLASSIFIED ADVERTISEMENTS.

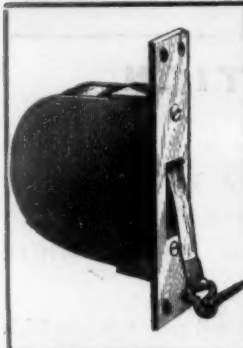
Air Brake Fittings
Stanley G. Flag & Co., Phila.
Air Brake Hose
N.Y. Belt & Pack Co., 15 Park Row, N.Y.
Air Brake Regulator
Mason Regulator Co., Boston.
Air Compressors & Rock Drills
Ingersoll-Sergeant Rock Drill Co., 10
Park Place, N.Y.
Rand Drill Co., 31 Park Place, N.Y.
Aluminum
Pittsburgh Reduction Co.
Architects
Bradford L. Gilbert, 30 Broadway, N.Y.
Thomas Appleton, 505 Rialto Bldg., Chic.
Asbestos Packing
H. W. Johns Mfg. Co., N.Y. City.
Asphalt Pavement
Wehn Pavement Co., 16 Exch. Pl., N.Y.
Axles
Cambria Iron Co., Johnstown, Pa.
Lima Machine Works, Lima, O.
Louisville Steam Forge Co., Louisv., Ky.
Michigan Car Co., Detroit, Mich.
Mich. Forge & Iron Co., Detroit, Mich.
Midvale Steel Co., Nictown, Phila.
Pittsburgh Forge & Iron Co., Pittsb., Pa.
T. Prosser & Son, 15 Gold St., N.Y.
Balanced Slide-Valve
M. C. Hammett, Troy, N.Y.
Ballast Unloaders
Horton Steam Shovel Co., Marion, O.
Banks
Brown Bros. & Co., 59 Wall street, N.Y.
Ball Cord & Couplings
Samson Cordage Works, Boston, Mass.
Blocks
Boston & Lockport Block Co., Boston.
Boilers
Abendroth & Root Mfg. Co., 28 Cliff St., N.Y.
Lidgerwood Mfg. Co., 96 Liberty St., N.Y.
Rich. Loco. & Mach. Co., Richmond, Va.
Boiler Plate
Schonberger & Co., Pittsburgh, Pa.
Bolt Cutters
Acme Machinery Co., Cleveland, O.
Howard Iron Works, Buffalo, N.Y.
Bolts & Nuts
American Supply Co., Kansas City, Mo.
Fuller Bros. & Co., 139 Gr'wich St., N.Y.
Rhode Island Tool Co., Providence.
Books & Publications
E. & F. N. Spon & Co., 12 Court St., N.Y.
John C. Trautwine, Jr.
Brake Adjusters
Q. & C. Co., Chicago.
Brake Beams
Nat. Hollow Brake Beam Co., Chic., Ill.
Northwestern Equipment Co., Chicago.
Schoen Mfg. Co., Pittsburgh.
Brakes
Beales Ry. Brake Co., 51 Broadway, N.Y.
Boydell Brake Co., Baltimore, Md.
Westinghouse Air-Brake Co., Pittsb., Pa.
Brake-Shoes
Congdon Brake-Shoe Co., Chicago, Ill.
Lapin Brake-Shoe Co., Broadway, N.Y.
Ramapo (N.Y.) Wheel & Foundry Co.
Bridges
Anderson & Barr, Jersey City, N.J.
Berlin Iron Bridge Co., E. Berlin, Conn.
Boston Bridge Works, Boston, Mass.
Chicago Bridge & Iron Co., Chicago, Ill.
Croford & Saylor, Philadelphia, Pa.
Detroit Bridge & Iron Wks. Del., Mich.
Edge Moor Bridge Wks., Wilmington, Del.
Elmira Bridge Co., Elmira, N.Y.
Hilton Bridge Const. Co., Albany, N.Y.
Keystone Bridge Co., Pittsburgh, Pa.
King Iron Bridge Mfg. Co., Cleveland, O.
Louisville Bridge & Iron Co., Louisv., Ky.
Mo. Val. Br. & R. Wks., Leavens, Kan.
Mt. Vernon Bridge Co., Mt. Vernon, O.
New Jersey Steel & Iron Co., Trenton.
Passaic Rolling Mill, Paterson, N.J.

Phoenixville Bridge Co., Phila., Pa.
Pittsburgh Bridge Co., 1115 Owings Bldg.,
Chicago.
Pottsville Bridge Co., Phila.
Rochester Bridge & R. Wks., Rochester.
A. & P. Roberts & Co., Philadelphia, Pa.
San Francisco Bridge Co., California.
Shahler & Schniglan, Chicago, Ill.
Shuffer Bridge Co., Pittsburgh, Pa.
Sooy-Smith & Co., 2 Nassau street, N.Y.
Union Bridge Co., 18 Broadway, N.Y.
A. L. Waddell, Kansas City, Mo.
Wallis Iron Works, Jersey City, N.J.
Youngstown (Ohio) Bridge Co.
Bridge Machinery
Valian Iron Works, Chicago.
Bridge Timbers
Alexander McClure, Pittsburgh, Pa.
Buildings
Berlin Iron Bridge Co., E. Berlin, Conn.
Buildings
Williams, White & Co., Moline, Ill.
Cars
American Supply Co., Kansas City, Mo.
Bloomington Car Co., Bloomington, Pa.
Osgood Bradley & Sons, Worcester, Mass.
J. G. Brill & Co., Philadelphia, Pa.
Reginald Canning & Co., 115 E'way, N.Y.
Ensign Mfg. Co., Huntington, West Va.
Erie Car Works (Limited), Erie, Pa.
Harvey Steel Car Co., Chicago, Ill.
Jackson & Sherry Co., Wilmington, Del.
Jackson & Woodin Mfg. Co., Berwick, Pa.
A. S. Males & Co., Cincinnati.
Michigan Car Co., Detroit, Mich.
Middletown Car Wks., Middletown, Pa.
N.Y. Equipment Co., 15 Wall St., N.Y.
R. M. Pencoast, Camden, N.J.
Pardee Car & Mach. Wks., Watson's Pa.
South Baltimore Car Works, Baltimore.
St. Charles Car Co., St. Charles, Mo.
Wason Mfg. Co., Springfield, Mass.
Youngtown (Ohio) Car Mfg. Co.
Cars, Second Hand
Reginald Canning & Co., 115 E'way, N.Y.
A. S. Males & Co., Cincinnati.
N.Y. Equipment Co., 15 Wall St., N.Y.
Car Couplings
Auto. Interchangeable Car Coupler Co.,
San Francisco, Cal.
Dreder Car Coupler Co., Rookery, Chic.
Gould Coupler Co., Buffalo, N.Y.
Hinson Car Coupler Co., Chicago, Ill.
McConway & Torley Co., Chicago, Ill.
McGill Iron Wks. Co., Peoria, Ill.
St. Louis Car Coupler Co., St. Louis, Mo.
Smilie Coupler & Mfg. Co., Newark, N.J.
Stilger & Strother Aut. Car Comp. Co.,
Louisville, Ky.
The Standard Car Coupler Co., Troy, N.Y.
Trojan Car Coupler Co., Troy, N.Y.
Thurmond Car Coupler Co., 90 E'way, N.Y.
Van Dorston Comp. Co., Phila., Pa.
Car Doors
Q. & C. Co., Chicago, Ill.
Car Furnishings
Adams & Westlake Co., Chicago.
Dayton Mfg. Co., Dayton, O.
Car Heaters
Baker Heater Co., 739 Gr'wich St., N.Y.
Consol. Car Heating Co., Albany, N.Y.
Gold Car Heat. Co., Frankfort St., N.Y.
Martin A. F. Car-Heat. Co., Dunkirk, N.Y.
Morton Safety Heating Co.
National Car Heating Co., Chicago.
Railroad Lighting & Mfg. Co., Phila., Pa.
Safety Car Heat. & Light Co., 180 E'way,
N.Y.
Car Heating Equipment
Stanley G. Flag & Co., Philadelphia.
Car Lamps and Lanterns
Adams & Westlake Co., Chicago.
Car Machinery
Greenlee Bros. & Co., Chicago.
Car Platform Scales
J. B. Goodwin, 29 E'way, N.Y.

Car Plushes
Sanford Mills, 129 Wash'ton St., Boston.
Car Pushers
Boston & Lockport Block Co., Boston.
Car Replacers
Q. & C. Co., Chicago.
Car Seats
Adams & Westlake Co., Chicago.
Hartford Woven Wire Mattress Co.,
Hartford, Conn.
Hale & Kilburn Mfg. Co., Phila.
Car Seals
Buffalo Seal & Press Co., Buffalo, N.Y.
Car Roofs
C. B. Hutchins's Sons, Detroit.
Lee Composite Mfg. Co., New York.
Car Upholstering
Knitted Mattress Co., Canton Jet., Mass.
Car Wheel Presses
Tintus Olsen & Co., Philadelphia, Pa.
Car Wheels
Allen Paper Car-Wheel Co., Chicago, Ill.
American Steel Wheel Co., N.Y. City.
Baltimore Car Wheel Co., Baltimore, Md.
Barnum & Richardson Mfg. Co., Chic.
J. H. Bass, Chicago, Ill.
Bowler & Co., Cleveland.
Cayuta Wheel & Foundry Co., Sayre, Pa.
Cushion Car Wheel Co., Indianapolis.
Davenport & Fairbairn, Erie, Pa.
Detroit Car-Wheel Co., Detroit, Mich.
Lidgerwood Mfg. Co., Indianapolis, Ind.
C. G. Eckstein & Co., 32 Liberty St., N.Y.
Jersey City Wheel & Mach. Works,
Lima Machine Works, Lima, O.
Union Iron Works, Chicago.
Louis, Car-Wheel Co., Louisville, Ky.
Michigan Car Co., Detroit, Mich.
N.Y. Car Wheel Works, Buffalo.
Taylor Iron & Steel Co., High Bridge, N.J.
Washburn Car Wheel Co., Hartford, Conn.
Wason Mfg. Co., Springfield, Mass.
A. Whitney & Sons, Philadelphia, Pa.
Car Window Balance
Caldwell Mfg. Co., Rochester, N.Y.
O. K. Gardner, Box 171, Pittsburgh, Pa.
Carriage Stands
Kalamazoo R. R. Veloc. & Car Co., Kal-
amazoo, Mich.
National Surface Guard Co., Chicago.
Coal Chute
Williams, White & Co., Moline, Ill.
Coal Transferring
C. W. Hunt Co., 45 Broadway, New York.
Consulting Engineers
Thomas Appleton, 505 Rialto Bldg., Chic.
G. Bouscaren, Cincinnati, O.
D. L. Barnes, The Rookery, Chicago.
J. P. Cross, 13 William St., N.Y.
J. A. L. Waddell, World Bldg., N.Y.
W. C. Foster, 32 Broadway, N.Y.
Geo. L. Fowler, 57 Broadway, N.Y.
Albert Lucius, 71 Broadway, N.Y.
W. B. Parsons, 35 Broadway, N.Y.
Chas. Palmer & Sons, 71 Broadway, N.Y.
F. H. Smith, 227 E. German St., Balto., Md.
Sam Schuch & Garret, Frederick, Va.
J. A. L. Waddell, Kansas City, Mo.
Wilson Bros. & Co., Philadelphia, Pa.
Consulting Electrical Engineers
Syracuse, Duncan & Hutchinson, N.Y.
Copper
Hendricks Bros., 49 Cliff street, N.Y.
Cordage
Samson Cordage Works, Boston, Mass.
Corrugated Iron
Cincinnati Corrugating Co., Piqua, O.
Cranes
Industrial Works, Bay City, Mich.
John N. Poage, Cincinnati, O.
R. D. Wood & Co., Philadelphia, Pa.
Yale & Towne Mfg. Co., Stamford, Conn.

Crescenting
Lehigh Valley Crescenting Wks. P.
Amboy, N.J.
Crescent Lumber & Construction Co.,
Fernandina, Fla.
Crossings
American Supply Co., Kansas City, Mo.
Fontaine Crossing Co., Detroit, Mich.
Crossing Gates
Bogue & Mills Mfg. Co., Chicago.
Culvert Pipe
Blackmer & Post, St. Louis, Mo.
Cupolas
Byram & Co., Detroit, Mich.
Door Springs
Norton Door Check & Spring Co., Boston.
Drift Rigging
Schoen Mfg. Co., Pittsburgh, Pa.
Drawbar Attachment
Amer. Cont. Draw-Bar Co., Aurora, Ind.
American Steel Wheel Co., N.Y. City.
Butler Drawbar Attach. Co., Cleveland.
Dredging Machinery
Bucyrus (O.) Steam Shovel & Dredge Co.,
San Francisco Bridge Co., California.
Vulcan Iron Works, Chicago.
Vulcan Iron Works, Co., Toledo.
Dross Forgings
Billings & Spencer Co., Hartford, Conn.
Electric Headlights
Nat. Elect. Headlight Co., Indianapolis.
Electric Motors
Thomson-Houston Motor Co., Boston.
Electric Railways
Thomson-Houston Electric Co., Boston.
Emery Wheels
N.Y. Belt & Packing Co., 15 Park Row.
Northampton Emery W. Co., Leeds, Mass.
Springfield Emery W. Mfg. Co., Bridge-
port, Conn.
Tantite Co., Stroudsburg, Pa.
Employment
Engineering Instruments
Chas. E. Brightly, Philadelphia, Pa.
Heller & Brightly, Philadelphia, Pa.
C. P. Ketchum & Co., 27 Nassau St., N.Y.
Keuffel & Esser, New York City.
Queen & Co., Philadelphia, Pa.
Young & Sons, Philadelphia, Pa.
Engines
Fishkill Landing Mch. Co., Fishkill, N.Y.
Lane & Bodley Co., Cincinnati, O.
Philadelphia Engineering Wks., Phila.
Excavators
Burrus (O.) Steam Shovel & Dredge Co.,
Industrial Works, Bay City, Mich.
A. S. Males & Co., Cincinnati, O.
Harmon Steam Shovel Co., Marion, O.
Osgood Dredge Company, Albany, N.Y.
J. Southern & Co., Boston, Mass.
Vulcan Iron Works, Chicago.
Vulcan Iron Works Co., Toledo.
Explosives
Rendrook Powd. Co., 21 Park Place, N.Y.
Feed-Water Purifier
Field Water Purifier Co., Chicago.
Flexible Shafting
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Birmingham, N.Y.
Freight Cars, Second Hand
New York Equip. Co., 15 Wall St., N.Y.
Freight Conveyors
Industrial Works, Bay City, Mich.
Forges
The Foss Mfg. Co., Springfield, O.
Frogs and Crossings
Allentown Rolling Mill, Allentown, Pa.
American Supply Co., Kansas City, Mo.
Cleveland (O.) Frog & Crossing Co.
Elliott Frog & Sw. Co., E. St. Louis, Ill.
Johnston R. R. Frog & Switch Co., Phila.
Pennsylvania Steel Co., Steelton, Pa.
Ramapo Iron Works, Ellipton, N.Y.
Union Switch & Signal Co., Pittsburgh.
Weir Frog Co., Cincinnati, O.

Furnaces
Abendroth & Root Mfg. Co., 28 Cliff St., N.Y.
Byram & Co., Detroit, Mich.
Gauges (Pressure)
Abendroth Mfg. Co., 28 Liberty St., N.Y.
Graders, Ditchers & R.R. Builders
F. C. Austin Mfg. Co., Chicago, Ill.
Guarantee Co.
Guarantee Co. of N. A., Montreal.
Hand Cars
The Buda Pdy & Mfg. Co., Harvey, Ill.
Fairbanks, Morse & Co., Chicago.
Kalamazoo (Mich.) R. R. Veloc. Co.
Sheffield Velpedede Car Co., Three
Rivers, Mich.
Harbor Works
S. V. Prescott, World Bldg., N.Y.
Headlights
Adams & Westlake Co., Chicago.
Nat. Elect. Headlight Co., Indianapolis.
Hoisting Engines
Copeland & Bacon, New York City.
Industrial Works, Bay City, Mich.
Lidgerwood Mfg. Co., 36 Liberty St., N.Y.
J. S. Bundy, Newark, N.J.
Vulcan Iron Works, Chicago.
Hollow Stay Bolt Iron
Falls Hollow Stay Bolt Co., Cuyahoga
Falls, O.
Hydraulic Jacks
Richard Dudgeon, 24 Columbia St., N.Y.
Joseph F. McCoy Co., 28 Warren St., N.Y.
Watson & Stillman, 20 E. 43d St., N.Y.
Hydraulic Machinery
Tintus Olsen & Co., Philadelphia, Pa.
Union Iron Works, San Francisco.
Watson & Stillman, N.Y. City.
R. D. Wood & Co., Philadelphia, Pa.
Inspectors of Bridges and Ry
R. W. Hildreth & Co., 2 Wall St., N.Y.
Insurance
Hart, Steam Boiler Insp. & Ins. Co.,
Hartford.
Royal Ins. Co., 30 Wall street, N.Y.
Interlocking Switches & Signals
Allentown Rolling Mills, Allentown, Pa.
Hall Signal Co., 30 E'way, N.Y.
Kelley R. R. Signal Co., Florence, Mass.
Nat. Switch & Signal Co., 60, Bethle-
hem, Pa.
Union Switch & Signal Co., Pittsburgh.
Wharton R. R. Switch Co., Phila.
Iron & Steel Ship Builders
Union Iron Works, San Francisco.
Injectors
Sathan Mfg. Co., 94 Liberty street, N.Y.
Wm. Sellers & Co., Philadelphia.
Jacks
Fairbanks, Morse & Co., Chicago.
McCarthy Mfg. Co., Dayton, O.
Richard Dudgeon, 24 Columbia St., N.Y.
Watson & Stillman, 20 E. 43d St., N.Y.
Journal Bearings
Ajax Metal Co., Philadelphia, Pa.
Inmanus Bronze Co., Pittsburgh, Pa.
Deoxidized Metal Co., Bridgeport, Conn.
D. A. Hopkins Mfg. Co., 148 Liberty St.,
N.Y.
Phosphor Bronze Smelting Co., Phila.
Paul S. Reeves, Philadelphia, Pa.
Journal-Bolt Lids
Ramapo (N.Y.) Wheel & Fdry Co.
Lighting
Railroad Lighting & Mfg. Co., Phila., Pa.
Safety Car Heat. & Light Co., 180 E'way,
N.Y.
Lock Washers
Nat. Lock Washer Co., Newark, N.J.
Locomotives
American Supply Co., Kansas City, Mo.
Baldwin Locomotive Works, Phila.



Attention Car Builders!

DO YOU WANT THE
**NEATEST,
SIMPLEST
STRONGEST**

CAR WINDOW BALANCE?

IF SO, WRITE TO
CALDWELL MFG. CO.
BOX NO. 1022,
ROCHESTER, N. Y., U. S. A.

Boiler, Locomotive AND Smoke Stack STEELS
QUALITY UNSURPASSED.
Plates up to 100 inches in width.
All flange perfectly. Any tensile strength required.
SHOENBERGER & CO., PITTSBURGH, PA.

Siemens-Martin OPEN HEARTH FIRE BOX STEEL
SOFTNESS, DUCTILITY AND PURITY.
Ingots, Slabs and Blooms.

PAUL S. REEVES, PHILADELPHIA.
PHOSPHOR BRONZE
IN INGOTS AND CASTINGS.
LEAD LINED CAR BEARINGS
A SPECIALTY.
Brass and Phos. Bronze Castings from 1 lb. to 5,000 lbs. in Weight.

KEUFFEL & ESSER CO., NEW YORK.
Delia BLUE PRINT PAPER.
Delia is the cheapest, no waste, no failures.
Delia makes the best prints.
Delia keeps longest and gives the most per-
manent prints.
IMITATIONS are plentiful. The principal advantage obtained for the imitations is the low price.
We claim that Delia is the cheapest, for the reasons stated above.
Delia Blue Print Paper is the best for prints for mailing, etc.
Columbia Blue Print Cloth, recommended for prints for rough usage.
Rigoline Paper gives black lines on white ground.
Positive fac-similes of drawings from tracings.
Samples, Price Lists and Information cheerfully furnished. Photo Printing for the Trade.

Hoosac Tunnel Route, FITCHBURG RAILROAD.
Short line between the East and West. Sleep-
ing and drawing-room cars on all express
trains.
J. R. WATSON,
General Passenger Agent.

THE VULCAN IRON WORKS CO., Toledo, O., U. S. A.
Manufacturers of
DREDGES AND EXCAVATORS.
Write for Photographs and Descriptive
Matter.
RAILROAD CASTINGS.

Malleable-Iron, Cast-Iron, Wrought-Iron and Steel Fittings

FOR WROUGHT-IRON PIPE.
Keystone Soft-Metal Union.

Ready for immediate use. Requires no washer. Can be made tight with but little pressure.

STANLEY G. FLAGG & CO.,
Nineteenth St., Penna. Ave. and Hamilton St., Philadelphia, Pa.



MANUFACTURERS OF
STEEL AIR-BRAKE FITTINGS.
Guaranteed air-tight, threads full and sharp, made from templates to standard gauge.
SPECIFY
FLAGG STEEL FITTINGS
FOR AIR-BRAKE CONNECTIONS.

"QUALITY AND EXCELLENCE OF WORKMANSHIP"

are the features upon which is based the acknowledged superiority of the

Drop Forgings and Machinists' Tools

Manufactured by

THE BILLINGS & SPENCER CO., HARTFORD, CONN.

SEND FOR CATALOGUE A.

RAILROAD GAZETTE DIRECTORY CLASSIFIED ADVERTISEMENTS

Locomotives (Continued)
Brooks Locomotive Works, Danbury, N.Y.
Cooke Loco. & Mach. Co., Paterson, N.J.
Dickson Mfg. Co., Scranton, Pa.
O. L. Fowler, 52 Broadway, N.Y.
Lima Machine Works, Lima, O.
A. S. Males & Co., Cincinnati, O.
N.Y. Equipment Co., 15 Wall St., N.Y.
Pittsburgh Loco. & Car Works, Pittsburgh, Pa.
R. K. Porter & Co., Pittsburgh, Pa.
Richmond (Va.) Loco. & Mach. Works, Rogers Loco. & Mach. Works, N.J.
Schenectady (N.Y.) Loco. Works, Schenectady, N.Y.
Tait & Carlin, London, Eng.
Wharton R. R. Switch Co., Phila.

Locomotive Headlights
Nat. Elect. Headlight Co., Indianapolis.
Locomotives, Second-Hand
Reginald Canning & Co., 115 B'way, N.Y.
A. S. Males & Co., Cincinnati, O.
N.Y. Equipment Co., 15 Wall St., N.Y.
Locomotive Staybolt Iron
Falls Hollow Staybolt Co., Cayahoga Falls, O.

Lubricators
American Supply Co., Kansas City, Mo.
Nathan Mfg. Co., 92 Liberty street, N.Y.

Machinists' Tools
Acme Machy. Co., Cleveland, O.
Bement, Miles & Co., Philadelphia, Pa.
Billings & Spencer Co., Hartford, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown & Sharpe Mfg. Co., Providence, R.I.
Ferracute Machine Co., Bridgeton, N.J.
Gould & Eberhardt, Newark, N.J.
Edw. Harrington, Son & Co., Phila.
Hayes Tool Co., Portland, Me.
Long & Allister Co., Hamilton, O.
Manning, Max. & Moore, 111 Liberty St., New York, N.Y.
Morse Tw. Dr. & Mach. Co., N. Red'd, Mass.
Newark Mach. Tool Wks., Newark, N.J.
Viles Tools Works, Hamilton, O.
Pedrick & Ayer, Philadelphia, Pa.
Geo. Place, 120 Broadway, N.Y.
D. Saunders' Sons, Yonkers, N.Y.
Wm. Sellers & Co., Philadelphia, Pa.
Stiles & Parker Press Co., Middletown, Conn.

Malleable Iron Castings
National Malleable Castings Co., Cleveland, Ohio.
Mandrel Rolled Staybolt Iron
Falls Hollow Staybolt Co., Cayahoga Falls, O.

Mining Machinery
Lidgerwood Mfg. Co., 92 Liberty St., N.Y.
Union Iron Works, San Francisco, Cal.

Nut Wringers
Boston Wringer Co., Boston.

Nut Locks
American Supply Co., Kansas City, Mo.
Amer. Washer & Mfg. Co., Newark, N.J.
Metcalfe, Paul & Co., Pittsburgh, Pa.
National Lock Washer Co., Newark, N.J.
Ruffner & Dunn, Philadelphia, Pa.
Standard Nut Lock Co., N.Y.

Oil Cans
Bryant & Barbey, 70 Milk St., Boston.
H. A. Williams Mfg. Co., Boston.

Oil
Signal Oil Works, Ltd., Franklin, Pa.

Packing, Asbestos
H. W. Johns Mfg. Co., N.Y. City.

Packing-Rubber
N.Y. Belting & Pack. Co., N.Y. City.

Paint
Address Paint & Color Co., 15 Cortlandt street, N.Y.

Pile Drivers
P. W. Devos & Co., Fulton St., N.Y.

Phosphor-Bronze
Paul S. Rees, Philadelphia, Pa.

Piling
American Supply Co., Kansas City, Mo.

Pneumatic Foundations
Bueyris (O.) Steam Shovel & Dredge Co., Industrial Works, Bay City, Mich.

Pipe Cutting & Threading Mach.
Lidgerwood Mfg. Co., 92 Liberty St., N.Y.

Presses
D. Saunders' Sons, Yonkers, N.Y.

Portable Drills
Frank Reed, Worcester, Mass.

Pressed Steel
Stow Flexible Shaft Co., Phila., Pa.

Pusher Mfg. Co.
Stow Mfg. Co., Binghamton, N.Y.

Refrigerators
Schoen Mfg. Co., Pittsburgh, Pa.

Refrigerating Machinery
Curtis Regul. Co., 98 Beverly St., Boston.

Rail Fastenings
American Supply Co., Kansas City, Mo.

Rail Fittings
American Supply Co., Kansas City, Mo.

Railroad Cars
R. H. Farnham, Camden, N.J.

Railroad Drills
So. & Pac. Refrigerator Car Co., Chicago.

Railroad Engines
De La Vergne Mfg. Machine Co., N.Y.

Railroad Locomotives
J. A. Thomson Mfg. Co., Waltham, Mass.

Railroad Rolling Stock
Rock Island & Rock Breakers, Chicago, Ill.

Railroad Tools
Ingelsoll-Sergeant Rock Drill Co., N.Y.

Railroad Washers
Rolling Stock to Lease, Piqua, O.

Railroad Wheels
Berlin Iron Bridge Co., E. Berlin, Conn.

Railroad Yards
Cincinnati Corrugating Co., Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Railroad Zippers
Rolling Stock to Lease, Piqua, O.

Chicago, Milwaukee & St. Paul.

Chicago & North Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Chicago & Western.

Kelley R. R. Signal Co., Florence, Mass.

Nat. Switch & Signal Co., So. Bethlehem, Pa.

Union Switch & Signal Co., Pittsburgh, Pa.

Valley & Young, 30 No. St., Baltimore, Md.

E. Van Noorden & Co., Boston.

Snow Shovels and Plows

Jul Mfg. Co., Brooklyn.

Leslie Bros. Mfg. Co., Paterson, N.J.

Solid Staybolt Iron

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Spikes

American Supply Co., Kansas City, Mo.

Dilworth, Porter & Co., Pittsburgh, Pa.

Q & C Co., Chicago.

Spring

Atkinson Steel & Spring Works, Chicago, Ill.

Farist Steel Co., Bridgeport, Conn.

A. French Spring Co., Pittsburgh, Pa.

Pickering Spring Co., Philadelphia, Pa.

Chas. Scott Spring Co., Philadelphia, Pa.

Stand Pipes

Schenectady, Cincinnati, O.

Sheffield Veloc. Car Co., Three Rivers, Mich.

Staybolt Iron

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

Falls Hollow Staybolt Co., Cayahoga Falls, O.

Steel

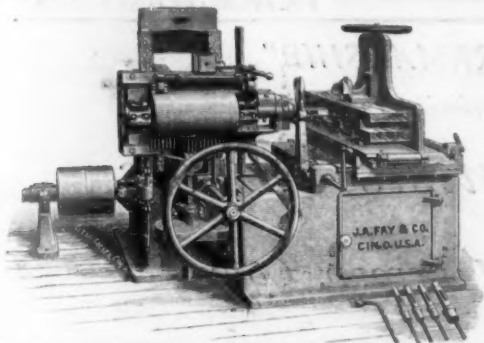
W. H. DOANE, Pres.

D. L. LYON, Secy.

J. A. FAY & CO.,

CINCINNATI, O., U. S. A.

CAN FURNISH

Car, Locomotive and Railway Shops

Complete Equipments

—OF—

**WOOD-
WORKING
MACHINERY.**

No. 3 New Improved Hollow Chisel Car Mortiser.

—AWARDED—

'Grand Prix,' Universal Exposition, Paris, 1889.

4 GOLD AND SILVER MEDALS AT

Chicago Railway Exposition of 1883.

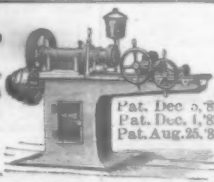
Catalogues and
Estimates Furnished
upon Application.**ACME MACHINERY CO.,**
CLEVELAND, OHIO,Manufacturers of
ACME BOLT & RIVET HEADERS

Acme Single & Double Automatic Bolt Cutters

Cutting from 1/4 in. to 6 in. diam.

Also, SEPARATE HEADS and DIES.

First Premium Cincinnati Centennial.



Pat. Dec. 3, '82

Pat. Dec. 1, '83

Pat. Aug. 25, '85

MORSE
TWIST DRILL & MACHINE CO.
MANUFACTURERS OF
Patent Machine Relieved Nut and
Hand Taps,
Suitable for use in Railroad, Car and Locomotive shops. We keep in stock a full line of U. S. or Franklin-Institute Standard Taps; also, V and Whitworth Threads also Pipe Taps, Pipe Reamers and Pipe Stocks, Dies, and Bushing

EVERY TOOL WARRANTED.

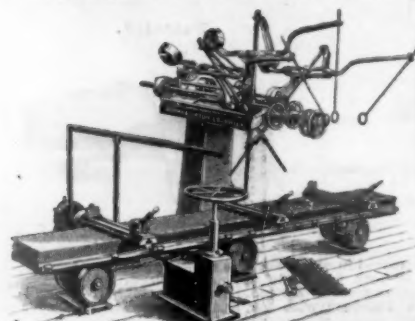
This cut shows the shape of the U. S. Franklin Institute Standard sometimes called the Sellers Screw Thread.

MANNING, MAXWELL & MOORE,
SOLE SELLING AGENTS,
111 LIBERTY STREET
NEW YORK.

Morse Twist Drill & Mch. Co.
Established 1864. New Bedford, Mass.
Manufacturers of Drills
for Metal or Wood,
Beach Chucks, Cutters, Reamers, Taps, Dies, Grinding Machines, and Special Tools.

CATALOGUES MAILED ON REQUEST

BERRY & ORTON CO.,
ATLANTIC WORKS,
Twenty-Second above Arch St., PHILADELPHIA, PA



Three-Spindle Universal Vertical Boring Machine.

Designers and Manufacturers of

**Machinery
for Working
Wood.**

Car Builders' Tools a Specialty.

Drawings and Estimates furnished upon application.

D. SAUNDERS' SONS

MANUFACTURERS OF

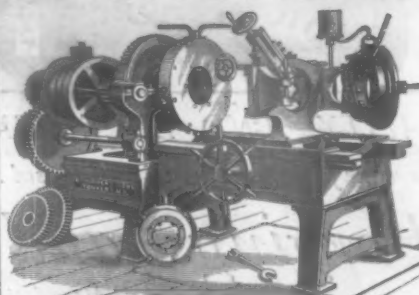
**Pipe Cutting and
Threading Machines**For Pipe Mill and Steam
Fitters' Use.**Tapping Machines**

For Steam Fitting. Also,

**STEAM AND GAS FITTERS
HAND TOOLS.**

31 Atherton Street.

Send for Catalogue B.

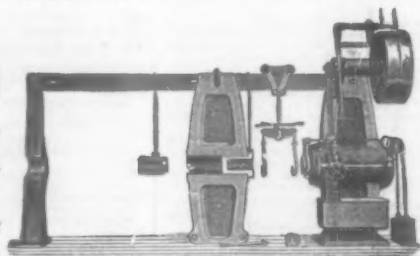
YONKERS, N. Y.

SEND FOR CIRCULARS.

BEMENT, MILES & CO.

PHILADELPHIA, PA.,

—BUILDERS OF—

**METAL-WORKING
MACHINE TOOLS**For Railroad Shops, Locomotive
and Car Builders, Machine Shops,
Steam Forges, Ship Yards, Boiler
Shops, Bridge Works, etc.Steam Hammers for Working
Iron or Steel.

Established 1867.

EDWIN HARRINGTON, SON & CO.

Works and Office

Cor. N. 15th St & Penn. Av., Philadelphia, Pa., U. S. A.

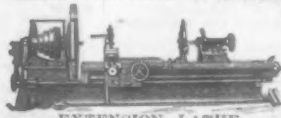
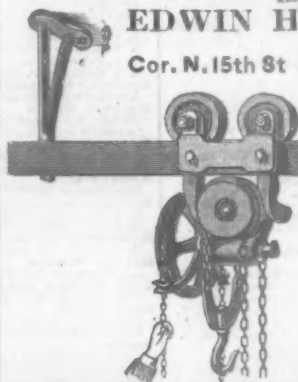
Manufacturers of a Full Line of

Iron Working Machinery,

INCLUDING

Extension and Gap Lathes, Planers with Quick
Return, Drills, etc., Hand Power Elevators with
Patent Brake, Double Chain Screw Hoists, Over-
head Tramway with Switch, Turntable and
Geared Truck.

Send for Estimates.

GEAR CUTTING A SPECIALTY.

EXTENSION LATHE.

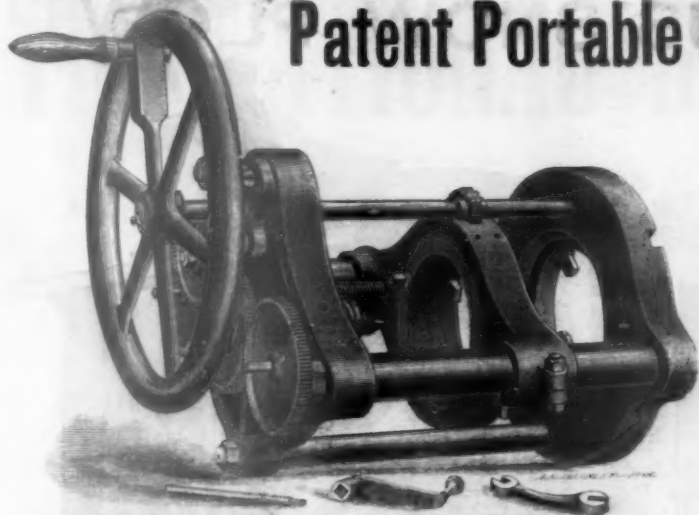
Greenlee Bros & Co.
SPECIAL
WOOD WORKING
MACHINERY.
SEND FOR DESCRIPTION OF OUR NEW
AUTOMATIC CAR MORTISERS, AND FOUR SPINDLE
CAR GAINER BORING MACHINE.
DOUBLE CUT-OFF MACHINE
CHICAGO.

The Long & Allstatter Co., HAMILTON, OHIO.
Double, Single, Angle-Bar, Gang, Horizontal, Twin, Beller, Spacing, Gate, Multiple, Belt and Steam-Driven
Punches & Shears.
Over 300 Sizes.
Send for New Catalogue.

LUDLOW VALVE MFG. CO
OFFICE AND WORKS
938 to 964 River Street, and 67 to 83 Van Avenue, Troy, N. Y.
VALVES
(Double and Single Gate, 1/4 in. to 48 in.—Outside and Inside Screws, Indicator, etc.), for Gas, Water and Steam. Send for circular.
ALSO, FIRE HYDRANTS.



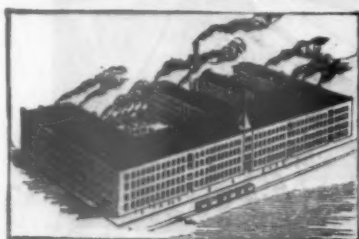
Patent Portable Improved Crank-Pin Machine.



THIS machine is very valuable for its particular work. The tools are easy of access, can be seen, and are readily adjusted. The wear can be taken up. It is easy to handle, and strong and powerful. It will quickly and accurately true up crank pins, taking off that part of the pin that is eccentric only, and leave the fillets at the corners. It will feed either way and fit any size pin. It will go over the collar of a consolidated engine pin, and for very small pins a collar is slipped into the circular cutter head and tool fastened to it, so it will not project far enough to spring. The end of the machine next to the driver contains a 4-jawed scroll chuck, with thin jaws that centre that end of the machine. At the opposite end there is a centre that slides into the centre of the pin. The machine is then mounted by the original centres, and is clamped in position by bolts passing through the spokes of the driver. The annular cutter-head containing the tools is driven by a small pinion, hand-wheel and shaft. From this shaft, by gearing, we get an automatic feed either way. The carriage containing the cutter head is given an even, smooth travel by two feed screws.

Circulars and Prices on Application.

PEDRICK & AYER, 1001 & 1003 Hamilton Street, Philadelphia, Pa.

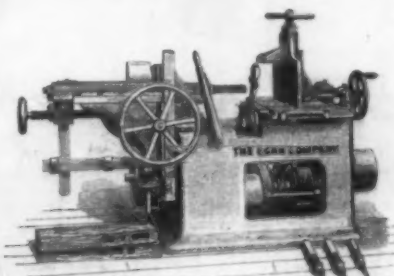


BUILDERS AND ORIGINATORS OF
LATE IMPROVED

THE EGAN COMPANY,

202 to 222 West Front St.,

CINCINNATI, OHIO, U. S. A.



Improved Automatic Square Chisel Car Mortiser and Borer. The Chisel Mandrel is driven by a New Improved Friction and Gearing, with a quick return, and raised and lowered by rack and pinion.

SEND FOR CIRCULARS AND INFORMATION.
CATALOGUE FURNISHED IF DESIRED.

FLOORERS, CUT-OFF SAWS, BAND RE-SAWS, BORERS, MOLDERS

Sill Dressers, Car Tenoners, Gaining Machines, Hollow Chisel Mortisers, etc.

WOOD-WORKING MACHINERY

For CAR SHOPS, CAR BUILDERS, RAILROAD REPAIR SHOPS, Etc.

E. W. BLISS CO., LTD.,

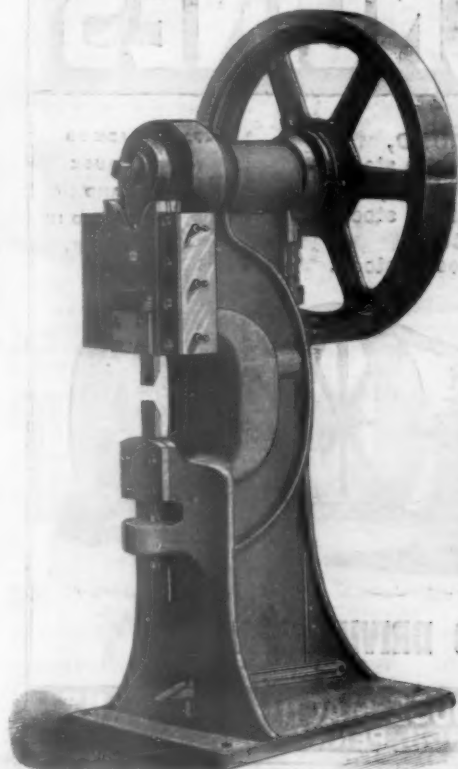
6 ADAMS ST., BROOKLYN, N. Y.,

OPERATING ALSO THE
WORKS OF

STILES & PARKER

PRESS CO.,

MIDDLETOWN, CONN.



Brass Founders' Power Spruce Cutter.
MADE IN FOUR SIZES.

We Make Foot and Power
Tools of All Kinds and Sizes
for Punching, Perforating,
Forging, Shaping, Bending,
Drawing, Embossing, etc.

Correspondence Solicited.

PUNCHES AND SHEARS, PRESSES,
DROP HAMMERS AND DIES.

Large Special "PUNCHES" and "SHEARERS"
for Bridge and Girder Work, Iron
Buildings, etc., etc.



Foot Screw and Drop. Also Cutting,
Punching, Forming, Shearing,
Embossing, Coining
and Drawing

PRESSES

OF ALL SIZES AND KINDS.

DRAWING PRESSES and DIES

For Lanterns, Lamps, Tinware,
Brass Goods, etc.

FERRACUTE MACHINE CO.,

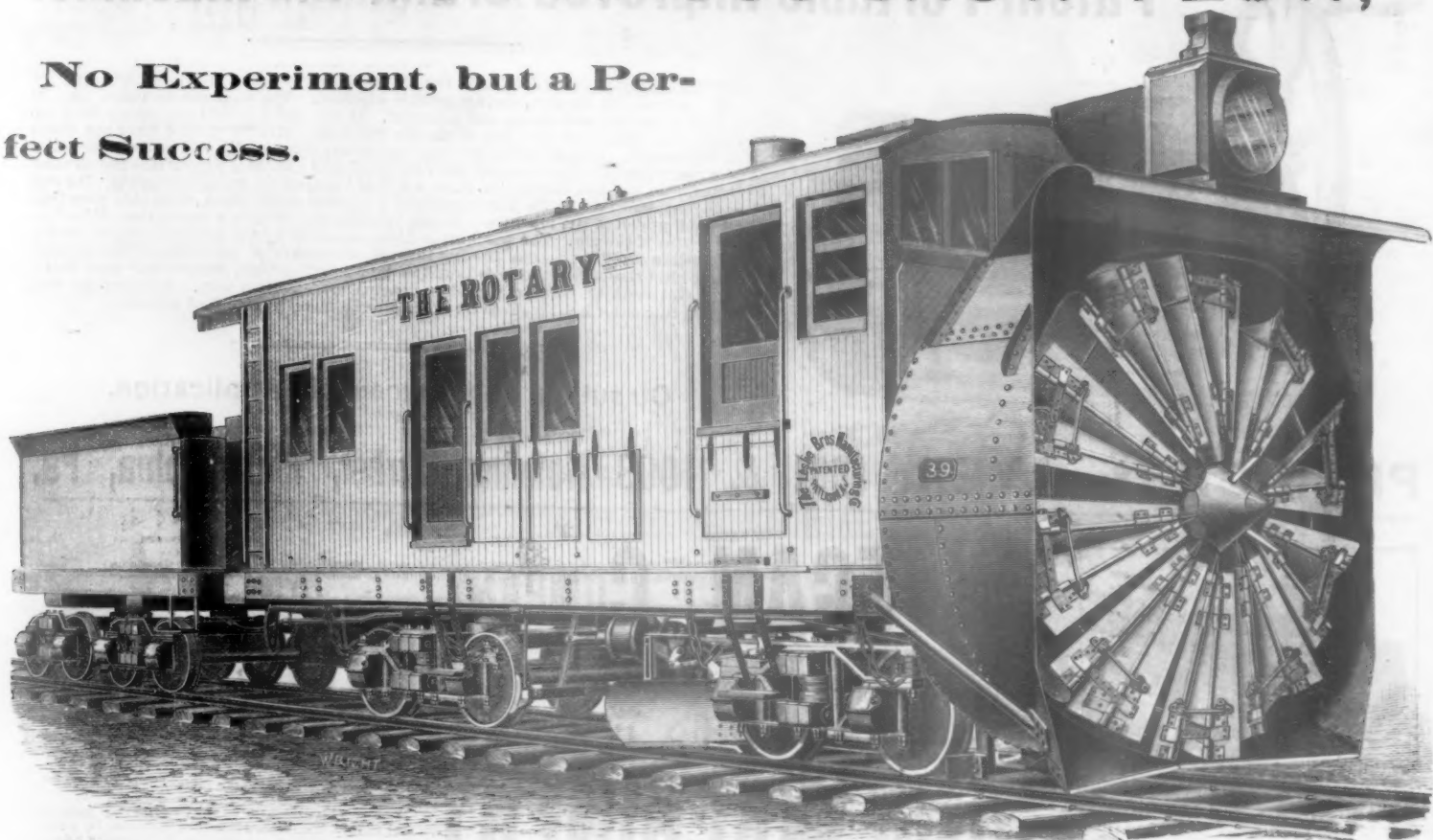
BRIDGETON, N. J., U. S. A.,

Manufacturers of all kinds of Presses, Dies and other Tools
for Sheet and Bar Metals.

Please Send for their Illustrated Price Lists, describing 150
kinds of Presses, Lathes, Rolls, Benders, Trimmers, etc.

AMERICA'S FAMOUS SNOW PLOW,

No Experiment, but a Perfect Success.



Is acknowledged to be without a RIVAL by the LEADING RAILROADS of AMERICA, and has been adopted by the GOVERNMENT STATE RAILROADS OF GERMANY and RUSSIA in EUROPE.

Orders for the Rotary for 1892 should be placed as early as possible to secure prompt and satisfactory delivery. For further particulars address

THE LESLIE BROS. MFG. CO., Paterson, New Jersey.

J. S. LESLIE, President.

M. SWEETNAM, Secretary and Treasurer.

HYDRAULIC JACKS.



JACKS TO LIFT
TO PUSH
TO PULL

All sizes. All styles. All warranted.
Hydraulic Transfer Jacks

For Removing Locomotive Drivers in 27 Minutes.

Car Wheel Presses. Crank Pin Presses.

Send for Catalogue.

WATSON & STILLMAN,

204-210 E. Forty-third St., New York.

WIRE ROPE
FOR ALL PURPOSES.
IRON AND STEEL WIRE OF ALL KINDS
TRENTON IRON CO.
TRENTON, N.J.
NEW YORK OFFICE
COOPER HEWITT & CO
17 BURLING SLIP
WIRE ROPE TRAMWAYS & C

WAIT FOR THE MCGILL SAFETY AUTOMATIC COUPLERS.

TONGUE AND BAR—DOUBLE LOCK—LINK AND PIN TYPE.

No. 1 With Spring.
Transition Coupler.

No. 2 Without Spring.
Final Coupler.

Automatic with Any Ordinary Link Coupler. AUTOMATIC WITH ITSELF.

THE VERTICAL PLANE MUST GO.

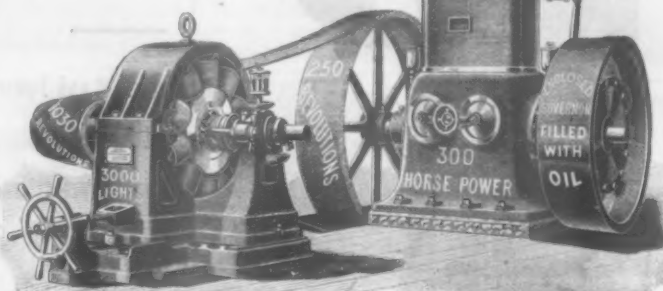
One will soon be shown, but
the correspondence followed.

MCGILL IRON WORKS CO.,
PEORIA, ILL.

WESTINGHOUSE ENGINES

AUTOMATIC COMPOUND,
9 sizes in stock.
STANDARD AUTOMATICS,
13 sizes in stock.
JUNIOR AUTOMATICS,
7 sizes in stock.

REPAIRS MADE TO
GAUGE
AND
CARRIED IN
STOCK.



COMPOUND DRIVING DYNAMO.

THE WESTINGHOUSE MACHINE COMPANY.
PITTSBURGH, PENNA. U.S. OF A.

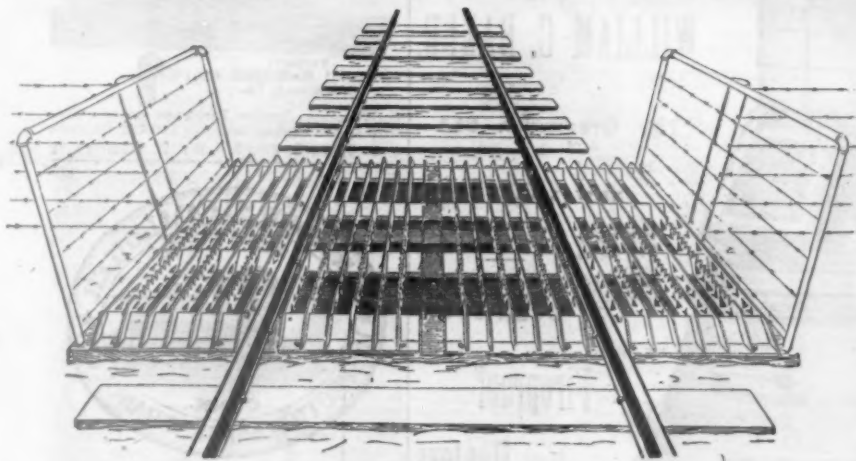
ALL GENUINE
INGOTS & MANUFACTURES
BEAR OUR
REG. TRADE MARKS.



Phosphor Bronze

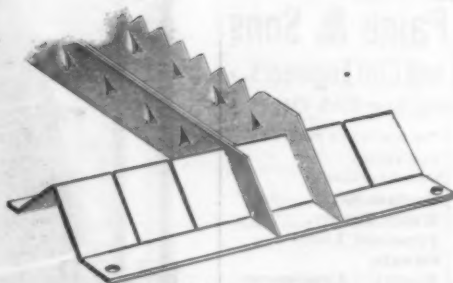
PHOSPHOR-BRONZE
INGOTS, CASTINGS, WIRE, SHEET & C.
THE PHOSPHOR BRONZE SMELTING CO. LIMITED
512 ARCH ST. PHILADELPHIA PA. U.S.A.
ORIGINAL MANUFACTURERS OF PHOSPHOR-
BRONZE IN THE UNITED STATES AND SOLE
MAKERS OF "ELEPHANT BRAND" PHOSPHOR-BRONZE

THE NATIONAL SURFACE GUARD CO.



No. 4.

J. T. HALL, Gen. Mgr. and Treas.
T. M. FISIL, Vice-Pres. and Sec'y.



Broken Section No. 4.

Manufacturers of Steel Surface Cattle Guards.
13,000 IN USE ON 160 RAILROADS

We Are the Original Manufacturers of Metal Surface Cattle Guards and Owners of
the Twelve Original Patents. The Efficiency of the National Guard
Is Proven by the Number Now in Actual Use.

THE NATIONAL SURFACE GUARD CO.,

E. F. LUCE, General Agent.

445 THE ROOKERY, CHICAGO, U. S. A.

CHICAGO SPLICE BAR MILL.

New England Agents,
SHERBURNE & CO.,
No. 53 Oliver St., Boston.

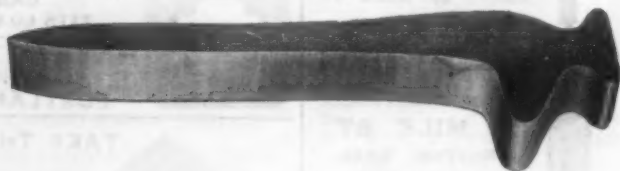
Morris Sellers & Co.,

OFFICE,
216 Phenix Building,
CHICAGO.

MANUFACTURERS OF THE

New "GREER" Railroad Track Spike and the Celebrated "SAMSON" Bar.

Fourteen years' unexampled success has demonstrated the fact that under all varieties of Railroad Service they will prevent "low joints," battered rail ends, and in a remarkable degree withstand the test of breakage. More than 10,000,000 Bars in use on 160 different Railroads, equivalent to 14,240 miles of track.



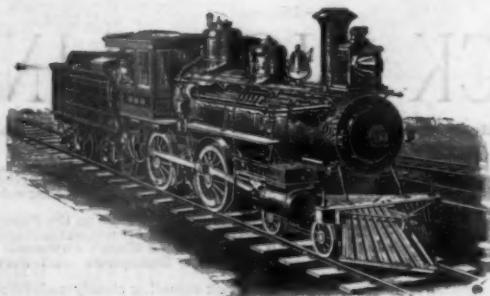
The "Greer" Railroad Track Spike is the latest and best spike offered to the Railroad managements of this country and Great Britain. Indestructible. A holding power of from one to two tons more per spike than any $5\frac{1}{2} \times 9-16$ spike. Automatically sharpened to chisel edge, it cuts; does not tear the wood fiber. Hand packed in kegs—every spike perfect. Particularly adapted for use on Bridges, Trestles, Frogs, Crossings and Switches. SEND FOR TESTS AND PHOTOGRAPHS.

THE FIELD FEED-WATER PURIFIER.

|| This device will not successfully handle **all waters**, but there are **none** that it will not improve. In a **large majority** it will demonstrate great economy.

The apparatus can be made at railroad shops at small expense.

A trial is solicited at our expense.



Cut showing Purifier Applied to Locomotive.

This water purifier is now in use and on trial on the following railroads:

Wisconsin Central.
Great Northern.
Northern Pacific.
Atchison, Topeka & Santa Fe.
Baltimore & Ohio.

We refer to each of them.

Office: 134 Van Buren Street.

CHICAGO, ILL.

Factory: 43d St. & Stewart Ave.

RICHARD DUDGEON
24 COLUMBIA ST., NEW YORK.
Maker and Patentee of
Improved Hydraulic JACKS



PUNCHES,
BOILER-
TUBE EXPANDERS AND
DIRECT-ACTING
Steam Hammers.
Communications by letter will
receive prompt attention.
Jacks for Pressing on Car
Wheels or Crank Pins made
to order.

Charles Paine & Sons
Consulting and Civil Engineers,
71 Broadway, New York City.

Rail Roads
Preliminary Surveys,
Location,
Construction,
Equipment,
Water Supply,
Terminal Yards
Signals,
Electric Appliances.
Improvement of Villages and Estates.

ESTABLISHED 1864.
CHARLES F. KETCHAM & CO.
27 & 29 NASSAU ST. NEW YORK,
RAILROAD PRINTERS & STATIONERS
KEEP IN STOCK OF MOST APPROVED FORMS
BOOKS FOR STATION AND TRAIN USE.
BAGGAGE RECORD, CASH, FRY. CONDUCTORS CAR LIST,
FRY. FORWARDED, FRY. RECEIVED, MANIFEST COPIES,
TEL. TRAIN ORDER, &c., &c.
PAPER AND BOOKS FOR
ENGINEERS AND CONTRACTORS USE
BLUE PROCESS, FIELD, QUANTITY, TRACING,
CROSS SECTION, LEVEL, PROFILE, TRANSIT,
DETAILED EST., TIME, PAY ROLL, TOPOG.,
NO. RETURN, DRAWING, WAGES TABLE, &c., &c.
PRINT, RULE AND BIND IN ANY QUANTITY
BLANKS AND BOOKS FOR RAILROADS,
AND KEEP **STATIONERY** FOR ALL.
YOUR ORDERS OR CORRESPONDENCE SOLICITED.

D. L. BARNES,
Mechanical and Consulting
Engineer.
**SPECIALTY: RAILWAY AND LOCO-
MOTIVE WORK.**

Marine and land engine tests made at short
notice. Recent and scientific methods used in
all work.
The completion of inventions to practical ap-
plication, including specifications and esti-
mates, forwarded by new methods.

73 BROADWAY, NEW YORK,
AND
Rockery Building, Chicago, Ill.

BOSTON WRINGER CO.
MANUFACTURERS,
Office: 79 MILK ST.,
BOSTON MASS.
BRYANT & BARBEY,
RAILROAD SALES AGENTS,
79 MILK ST.,
BOSTON, MASS.

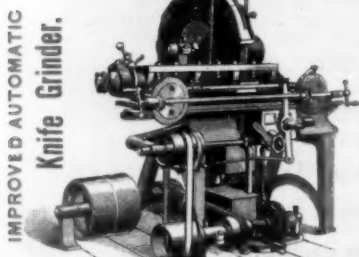


Hottest water
and strongest
lyes can be used,
as hands never
touch the mop.

Light,
Durable
and easily
Operated.

Springfield Emery Wheel Mfg. Co.,
BRIDGEPORT, CONN.

**IMPROVED AUTOMATIC
Knife Grinder.**



Water prevents heating and drawing the temper
Once in motion requires no attention. Write for
Illustrated Catalogue.
Western Branch: 70 Canal Street, Chicago.

Fireproof Baker Car Heater

MANUFACTURED ONLY BY

WILLIAM C. BAKER,

799 Greenwich St.

NEW YORK.

OVER 500

**Fireproof
Heaters**

New in Use.

The Northern Pa-
cific have..... 116
The Canadian Pa-
cific..... 32
The Minneapolis,
St. Paul & Sault
Ste. Marie Ry.... 43
The Philadelphia
& Reading..... 70

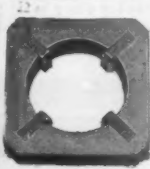
Also in private care
of JAY GOULD, Presi-
dent of the Missouri
Pacific; GEO. B. ROB-
ERTS, President P.
R. R., and JAS. Mc-
CREA, First Vice-Pres-
ident of Pa. Co.




This cut shows the plain, Flexible Steel, Jointless Fireproof Baker Heater, which holds the
fire secure.

SEND FOR NEW ILLUSTRATED CATALOGUE


EASY CUTTING.
CAN BE SHARPENED,
CAN BE ADJUSTED,
FITS COMMON STOCK.



HAYES TOOL CO.,
41 AND 43 CROSS ST.,
PORTLAND, MAINE.



TAKE THE STONINGTON LINE.
ALL FARES REDUCED.
The Inside Route Between New York and Boston,
Providence, Worcester and all Eastern Points.
Steamers Rhode Island and Narragansett leave New
York from new Pier 36, N. R., one block above Canal St.
at 5.00 P. M., daily, except Sunday, connecting with 3 Ex-
press Trains for Boston. Steamboat Express with Reclin-
ing Chair Cars Free of Charge.



J. W. MILLER, President.

O. H. BRIGGS, G. P. A.

AMERICAN PRACTICE —IN— BLOCK SIGNALING,


With Descriptions and Drawings of the Different Systems in Use on
Railroads in the United States.

This is a handsomely printed, elegantly bound volume, 7 1/4 in. x 9 in. It describes clearly
the Simple Block System, Single Track Blocking System, Automatic Clockwork Track-
Circuit Signals and the Electro-Pneumatic Track-Circuit System.
It contains elaborately illustrated descriptions of the systems in use on the Pennsylvania,
Boston & Albany, Fitchburg and New York Central roads, and correct engravings and de-
scriptions of the Westinghouse Pneumatic, the Hall Automatic and Black's Automatic Systems;
and also of the Illuminated Semaphore, Koyl's Parabolic Semaphore and Stewart-Hall
Train Order Signal.
The book is designed to make the methods of block signaling clearly understood and to
show the present development of the art on American railroads.

PRICE, \$2.00.

Published and for Sale by **THE RAILROAD GAZETTE**, 73 Broadway, N. Y.

CAR WINDOW




BALANCE

Factory:
439 to 361 Washington Ave.,
Allegheny, Pa.
For Passenger Coaches, Parlor and sleeping Cars
Used by the leading Railroads and Car-Builders
J. K. GARDNER, Mfr., P. O. Box 171, Pittsburgh, Pa.



**ROYAL
(FIRE)
INSURANCE COMPANY**
Of Liverpool, England.
ESTABLISHED 1845.
HEAD OFFICE METROPOLITAN DISTRICT,
No. 50 Wall St., New York.
TRUSTEES:
JACOB D. VERMILY, HENRY PARKISH,
OSGOOD WELSH.
E. F. REDDALL, Manager.
W. W. HENSHAW, Asst. Manager

H. A. WILLIAMS MFG. CO.
SOLE MANUFACTURERS OF THE
WILLIAMS' DRAPER AND SYPHON
STEEL AND BRASS OILERS AND LAMPS.



BRYANT & BARBEY
Sole R. R. Sales Agents,
79 Milk St., Boston, Mass.

TRAVEL VIA THE

**Burlington
Route**
C.B. & Q.R.R.

TO ALL
POINTS WEST,
NORTHWEST,
and SOUTHWEST.
P. S. EUSTIS, Gen. Pass. and Ticket Agent
CHICAGO, ILL.

BOLT CUTTERS
Schlenker's Automatic Bolt Cutters
and Screw-Cutting Machines.
HOWARD IRON WORKS, BUFFALO, N. Y.
Established 1845.

**ROBERTS' PATENT
WOVEN WIRE CAR SEATS
RATTAN PLUSH SEATS**
PATENT WOVEN WIRE SEAT, BACK SPRING,
ADDRESS FOR CATALOGUE, ESTIMATES ETC.
THE HARTFORD WOVEN WIRE MATTRESS CO.
HARTFORD, CONN.

Broadway Corner Building to Let.

In central location, suitable for offices of
RAILROAD COMPANIES.
Building about 63 x 100, with Steam Elevators.
For particulars apply to
HORACE S. ELY, 64 Cedar St.

New Revised Edition of
CAR-BUILDERS DICTIONARY
Price, 53 a copy.



Published Every Friday at
73 Broadway, N. Y.

\$4.25 PER YEAR TO UNITED STATES AND CANADA
\$5.00 " " " FOREIGN COUNTRIES.

Express money orders, drafts, or P.O. orders
or registered letters should be made to the order
of the RAILROAD GAZETTE.

EMPLOYMENT.

WANTED—CIVIL ENGINEER TO
superintend and be employed to survey new
railway line in the locality. Send par-
ticulars as to self and route to "CAPITAL-
IST," care Railroad Gazette, 73 Broadway,
New York.

A CIVIL ENGINEER WITH EX-
perience on location, construction and
maintenance of railroads, and on mole and
harbor works, desires a position. Good refer-
ences. Speaks and writes Spanish. Address
L. J., care Railroad Gazette, 73 Broadway,
New York.

WANTED—A THOROUGHLY COM-
petent Superintendent for Car Works;
must be energetic and fully competent to
make contracts and estimates; give fully de-
tails of positions filled and references. Ad-
dress "C. M. A.," care Railroad Gazette, 73
Broadway, New York.

A MECHANICAL ENGINEER, WITH
thirteen years' experience in railroad
shops and drawing room, desires a position
in charge of a motive power department. Prime
object being to keep or put locomotives and
cars upon a commercial basis by the adoption
of the most advanced and accepted methods
for obtaining economical consumption of fuel
and maintenance of power and rolling stock.
Member of the American Society of Mechan-
ical Engineers. Address, "AJAX," 12 W. 31st
street, New York.

WANTED AND FOR SALE.

FOR SALE.
We own and offer for sale 800 tons of selected
second-hand 52 lb. steel rails for prompt ship-
ment. Rails can be inspected at Pittsburgh.
Price quoted on application to

ROBINSON & ORR,
Fidelity Building, Pittsburgh, Pa.

FOR SALE.

Second-Hand Standard Gauge Locomotives, with Westinghouse Air-Brakes;
for immediate delivery. **NINE ENGINES FOR DELIVERY AT NEW YORK:** Cylinders,
10 in. x 14 in. and 10 in. x 16 in.; weight, 36,000 lbs., 33,000 lbs. **TEN ENGINES FOR**
WESTERN DELIVERY: Cylinders, 15 in. x 22 in., 15 in. x 24 in., 16 in. x 22 in., 16 in. x 24 in.;
weight, 59,200 lbs. to 70,000 lbs. Builders: Baldwin, Rhode Island, Grant and Pittsburgh.

Steel Rails, Fastenings, and All Classes of New and Second-Hand Equipment.

Full description furnished on application.

GEO. A. EVANS, 40 & 42 Wall St., New York.

FOR SALE.

One standard gauge Baldwin locomotive,
cylinders 12 in. x 20 in., double ender, weight
60,000 lbs., with Westinghouse brake, nearly
new; two Suburban passenger coaches.
One combination baggage and passenger
coach, all with Westinghouse brakes, nearly
new.

Above is now in Florida and can be delivered
at once.

Baggage, mail and express car, length 45 ft.
2 in.

Two open excursion cars, seating 85, for New
York delivery.

HUMPHREYS & SAYCE,

10 Wall Street, New York.

FOR SALE—AN OFFICIAL CAR, 48
ft. long, with six-wheel steel tired trucks,
five Pullman sections, kitchen and observa-
tion room complete. Just out of shops. A
bargain. For particulars address W.
P. R. R., General Purchasing Agent, N. P.
R. R., St. Paul, Minn.

FOR SALE—ONE WORTHINGTON
compound duplex pump; high pressure
25, low 25; stroke 24 in. Plungers alu-
minum, bronze and steel fittings, and
cylinder, 1,500,000 galls. capacity. Boiler, 500 H.
P., for 500 lbs. steam; Duplex (10 x 7 x 12); 800
H. P. Corliss engine, 2 Admiralty pumps,
pressure pipe, 4 in., 8 in., 10 in.; boilers,
boilers, crushers, tanks, compressors, ham-
mers, locomotives, cars, steam shovels, con-
tractors' tools and radiators. W. S. MIDDLE-
TON, 25 John St., New York.

WHEEL PRESS WANTED—WISH
to correspond with parties having a
good second-hand machine for sale. State
capacity and other particulars. **RAND DRILL**
CO., N. Tarrytown, N. Y.

ENGINEER'S AND FIREMAN'S

TIME, EXPENSE

MEMORANDUM ACCOUNT BOOK.

DESIGNED AND COPYRIGHTED BY

E. W. YATES.

A pocket memorandum book with rubber
tipped pencil, attached, with calendar and
pages most conveniently arranged for the en-
gineer or fireman to keep his own daily record
of time and miles run, rate and amount earned;
also for individual expense account each month
and for general memoranda. A certain meth-
od of checking with the timekeeper in case of
disagreement. It lasts one year, and every
engineer and fireman should have one. Price
50 cents each; \$30.00 for fifty copies, or \$35.00 a
hundred. An agent wanted on each road.

PUBLISHED AND FOR SALE BY
THE RAILROAD GAZETTE, 73 Broadway, N. Y.

METAL SKYLIGHTS

Made of galvanized iron and copper. Absolu-
tely no leakage from any source; no dripping
or sweating; fire-proof; ventilating.
Galvanized iron and copper cornices and gutters.
Sheet metal work for buildings. Send for illustrated
circular.

E. VAN NOORDEN & CO.,
383 Harrison Ave. BOSTON, Mass.

TEAR AND STREET RAILS,
SPICE BARS, TRACE
BOLTS AND NUTS,
R. H. SPIKER.

FRIGES, CROSSING,
SWITCHES AND FIX-
TURES.

IRON AND STEEL AXLES,
CAR TRUCK CHAINERS,
WOODEN IRON TURN-
BUCKLES, LEERS AND
PINS AND CAR
COUPLERS.

HAR IRON AND STEEL,
SHEET IRON AND STEEL,
CORRUGATED IRON.
STEAM SHOVELS,
BALLAST UNLOADERS,
AND STEAM CRANES.

LOCOMOTIVES AND CARS OF
ALL KINDS.

A. T. SHOEMAKER,
Railroad Supplies
and Equipment.

(New and Second Hand.)
ROBERT BUILDING, CHICAGO.
146 BROADWAY, NEW YORK.

BEAMS, CHANNELS, ANGLES
TEES AND ODD SECTIONS.

VAILE & YOUNG'S Patent Metallic Skylights



HALF SIZE.

Without Putty.
Construction
adapted to all
forms and styles of
skylights. Thou-
sands of feet in use
have proved its su-
periority. Particu-
larly adapted for
Depots, Mills, Fac-
tories, etc., where
large and contin-
uous lights are re-
quired. Send for
illustrated Cata-
logue.

216 N. Calvert St., Baltimore, Md.

QUEEN & CO., PHILADELPHIA,

MANUFACTURERS OF

Engineers', Surveyors' and
Draughtsmen's Supplies.

Improved Complete Engineers' Transit.



Power of telescope, 24 diam. Compound
long centers. Two outside verniers. Five-in.
needle. Level to telescope, vertical arc, clamp
and tangent and the usual accessories. Com-
plete with box and tripod. **PRICE, \$150.**

ENGINEERS' PLAIN TRANSIT.

Same as above, without level, arc or clamp
and tangent. **PRICE, \$150.**

Improved Engineers' Wye Level.

Telescope, 18 or 20 in. Power, 40 or 56
diameters, as desired. Shifting center. Com-
plete with box and tripod and usual acces-
sories. **PRICE, \$110.**

Any of these instruments sent on approval,
with privilege to return if not satisfactory.

CATALOGUE ON APPLICATION.

M. A. WILDER, Pres.; T. S. BULLOCK, V.-P.; V. A. WILDER, Treas.; F. C. B. AVERY, G. M.

THE NEW YORK RAILWAY SUPPLY CO., Limited,

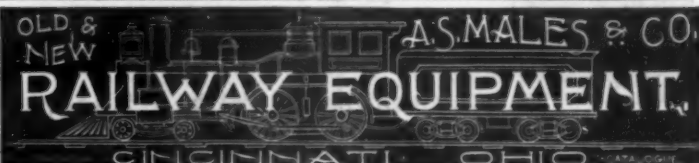
40 AND 42 WALL STREET, NEW YORK.

Steel Rails, all sections; Track Fastenings, Locomotives and Cars of all descriptions,
both New and Second-hand, for Cash or on Car Trust Plan.

Purchasing Agents Monterey & Mexican Gulf R. R.

Railway contracts and securities negotiated.

Correspondence solicited.



JANUARY 1, 1892.

SEND FOR SPECIAL LIST OF

New and Second Hand Machinery

FOR SALE AT LOW PRICES BY

GEORGE PLACE,

Office, 120 Broadway, New York. Storehouse, 511 & 513 W. 13th St., New York.

INTERNATIONAL RAILWAY EQUIPMENT AND SUPPLY CO.
INCORPORATED.

PRINCIPAL OFFICE "ALDRICH COURT," 45 BROADWAY, N. Y.

ORDERS AND INQUIRIES SOLICITED FOR EVERY DESCRIPTION OF

RAILWAY EQUIPMENT AND SUPPLIES.

G. W. BENTLEY, Pres.

G. LEVE, V. P. & G. M.

AMERICAN SUPPLY CO.

First Floor, Boston Building,
KANSAS CITY, MO.

RAILWAY EQUIPMENT AND SUPPLIES.

New and Second-Hand Rails.

Track Material. Locomotives and cars.
Car Trusts Negotiated.

LINK BELT MACHINERY CO.

CHICAGO, ILL.

MANUFACTURERS OF IMPROVED

FREIGHT AND COAL

HANDLING MACHINERY.

CHARLES S. HELLER

TRADING AS

HELLER & BRIGHTLY,

MANUFACTURERS OF

ENGINEERING, MINING AND SURVEYING

INSTRUMENTS,

Cor. SPRING GARDEN STREET and RIDGE AVENUE

PHILADELPHIA, PA.

CHARLES H. BRIGHTLY.

TRADE MARK.

Late of HELLER & BRIGHTLY,

MANUFACTURER OF

**Mathematical, Engineering and Surveying
INSTRUMENTS.**

Germantown Junction, P. R. R.

18th St. Station, P. & R. R. R.

PHILADELPHIA, PA.



THE NATIONAL MALLEABLE CASTINGS CO.

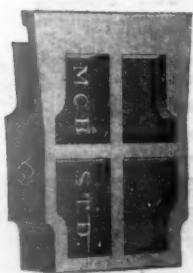
—OPERATING THE—

Cleveland Malleable Iron Works.
Indianapolis Malleable Iron Works.

Chicago Malleable Iron Works.
Toledo Malleable Iron Works.

—MANUFACTURERS OF—

REFINED MALLEABLE IRON CASTINGS.



Draw Bars, Center Plates, Side Bearings, Truck Ends, Chafing Plates, Swing Hanger Bearings and Pivots, Dead Blocks, Draw Bar Stops, Brake Hangers, Door Fasteners and many other articles used in Car Construction and Repairs.



Head Chairs, Step Chairs, Slide Switch Plates, Rail Braces, Switch Nibs, and other Castings used in Maintenance of Way. Shop, Engine and Track Wrenches. Other Castings made to order.

Our Largely Increased Facilities Justify Us in Soliciting Your Patronage

Address the NATIONAL MALLEABLE CASTINGS CO. at either of the four points named above.

GEO. A. BOYDEN, President.

WM. WHITRIDGE, Treasurer.

CHAS. B. MANN, Secretary.

THE BOYDEN BRAKE COMPANY,

BALTIMORE, MD., U. S. A.

MANUFACTURERS OF

AUTOMATIC QUICK-ACTION AIR BRAKES

FOR PASSENGER CARS, FREIGHT CARS AND TENDERS.

ALSO DRIVER BRAKES AND AIR EQUIPMENT FOR ENGINES.

The Entire Brake and Signal Apparatus Is Interchangeable with the Westinghouse

OUR APPARATUS IS IN SUCCESSFUL OPERATION ON 45 ROADS.

THOS STURGIS, President.

WM. C. LANE, Secretary and Treasurer.

C. P. MACKIE, General Manager.

S. S. BOGART, General Agent.

ELECTRIC SECRET SERVICE COMPANY

45 BROADWAY, NEW YORK.

Owning the Patents of Mosher, Gill, Hatch, Foote, Kintner and Moore for
Individual Telegraph Call and Cut - Out Apparatus
FOR RAILWAY SERVICE.

OTHER PATENTS PENDING. The Only Practical and Reliable System Invented. Use either MORSE KEY or AUTOMATIC TRANSMITTER. To every call an AUTOMATIC ANSWER-BACK is received from the Station Called. Gong rings until shut off by operator. Any office on line can be selected without disturbing the others and either called up or cut out. No interference with regular telegraph service. No resistance added to main line. Easily applied. Economical. Convenient. Reliable. THE PUBLIC IS WARNED AGAINST INFRINGING COMPANIES AND DEVICES. For terms and other particulars address as above.

M. C. B. COUPLERS.—COMPARISONS.

Official Records, 10,676

Standard Couplers.

Date.	Drawheads.	Knuckles.
September, 1890, -	- 5	49
October, " -	- 8	81
November, " -	- 45	147
December, " -	- 50	131
January, 1891, -	- 22	116
February, " -	- 66	122
March, " -	- 63	172
April, " -	- 51	176
May, " -	- 13	100
June, " -	- 28	110
July, " -	- 13	72
August, " -	- 19	104
September, " -	- 21	73
October, " -	- 18	112
Total, -	422	1,368

PERCENTAGE OF BREAKAGES FOR ONE YEAR.

Drawheads, -	-	-	-	3 ³⁹ ₁₀₀
Knuckles, -	-	-	-	12 ⁵⁴ ₁₀₀

LIFE.

Drawheads, -	-	-	30 years.
Knuckles, -	-	-	8 "

The Standard Car Coupling Co.

Will contract with any railroad company to equip 1,000 or more cars at low prices, and will agree to maintain them for

\$650 PER THOUSAND CARS.

Compare the Following:

10,000 Couplers.

Date.	Drawheads.	Knuckles.
September, 1890 -	- 174	138
October, " -	- 147	311
November, " -	- 274	492
December, " -	- 283	308
January, 1891 -	- 252	382
February, " -	- 271	484
March, " -	- 249	638
April, " -	- 223	322
May, " -	- 216	360
June, " -	- 227	311
July, " -	- 231	434
August, " -	- 232	433
Total, -	2,781	3,433

PERCENTAGE OF BREAKAGES FOR ONE YEAR.

Drawheads, -	-	-	-	27 ⁸¹ ₁₀₀
Knuckles, -	-	-	-	54 ⁵⁵ ₁₀₀

LIFE.

Drawheads, -	-	3 yrs. 6 mos.
Knuckles, -	-	1 " 9 "

Should seventy-five per cent. of above breakages be replaced without charge, and twenty-five per cent. at, say **\$9.20** each for drawheads, and **\$2.80** for knuckles, the cost of maintenance would be about **\$2.04** per car per annum, and would cost, exclusive of locks, etc.

\$2,040 PER THOUSAND CARS.

The Standard Co. is also prepared to contract with Railways and Railway Systems, for a part of their equipment, at low prices, and guarantee to replace ALL breakages (including locks) of the Standard Coupler (WITHOUT CHARGE) FOR ONE YEAR OR LONGER, and to furnish security for the fulfillment of contracts.

THE STANDARD CAR COUPLING CO.,

Main Office: 45 Broadway, NEW YORK. CHICAGO OFFICE: 1018 The Rookery.

A SIGNAL SUCCESS.

OUR SYSTEMS

of automatic electric block signals (on wire and rail circuits) are working with great satisfaction to the railroad companies using them, and in almost every case their use is being extended.

Our new rail-circuit systems are showing unparalleled results. Eleven of these signals on a certain road have been operating over five months with a record of but three train stops (caused otherwise than by trains in block and open switches), and these were due to signals being struck by lightning, and to one broken battery jar. They have also operated with **ABSOLUTE RELIABILITY**. On another road the record is even better; no unnecessary stops whatever being charged against the signals; and the integrity of the system has been fully proven.

We can, therefore, safely challenge comparisons with other rail-circuit systems, being confident that no better records can be shown, or as good.

Having substantiated our claims to the complete satisfaction of many leading railroad officials, we are now engaged in applying the systems on several new lines, and we are also engaged in preparing **PLANS AND ESTIMATES FOR THE APPLICATION OF THE SIGNALS FOR MANY OTHER COMPANIES**, several of whom do not consider any other signal than

== THE HALL. ==

We pride ourselves on the excellent and honest character of our work, and beg to assure all who deal with us that they will be fairly and squarely treated, and always with the assurance of satisfaction. All correspondence that may be addressed to our New York or Chicago office will receive careful and immediate attention, and any inquiries on any subject relating to our specialties will command the professional knowledge and skill of our engineering department.

THE HALL SIGNAL COMPANY.

50 Broadway, New York.

340 The Rookery, Chicago.

WILLIAM P. HALL, President.
S. MARSH YOUNG, General Agent.
C. W. BREWSTER, Sales Agent.

W. S. GILMORE, Treasurer.
MELVILLE P. HALL, Secretary.
A. J. WILSON, Sup't Electrical Construction.

HENRY BEZER, Mechanical Signal Engineer.

INDUSTRIAL WORKS,

BAY CITY, MICH.

NEW YORK AGENCY

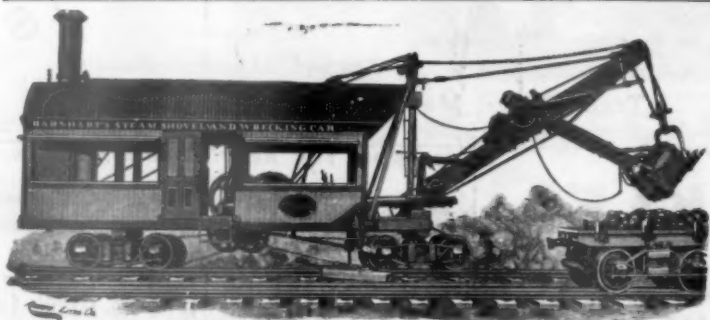
OFFUTT & CO.,

Corner Church and Rector Street

CHICAGO AGENCY

L. M. SLACK,

411 Phenix Building.

**CRANES,
WRECKING CARS,****STEAM SHOVELS,****PILE DRIVERS,****RAIL SAWS,****TURN-TABLES,****TRANSFER TABLES,****FREIGHT CONVEYORS.**

One and One-half Yard Shovel.

MARION STEAM SHOVEL COMPANY

MANUFACTURERS OF

BARNHARDT'S PATENT STEAM SHOVELS, WRECKING CARS AND DREDGES
RAILROAD DITCHERS AND BALLAST UNLOADERS.

All of our machines guaranteed to give entire satisfaction, otherwise may be returned at our expense.
For further information, photographs, catalogs and discounts address

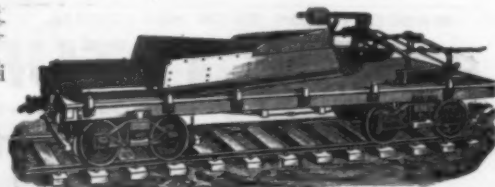
Marion Steam Shovel Co.

595 West Centre Street,

MARION, O.

San Francisco Office:

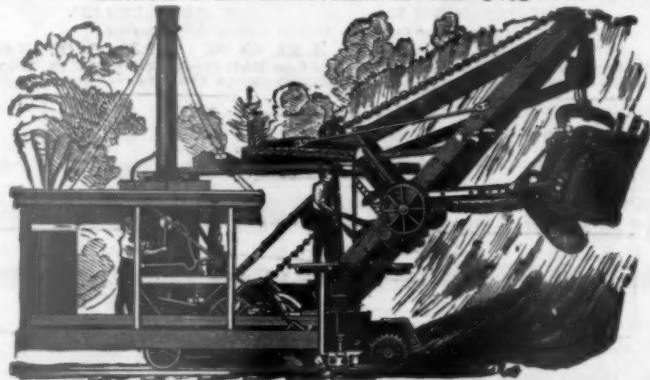
Geo. W. Barnhardt, 4 Sutter St.



Barnhardt's Patent Ballast Unloader.

JOHN SOUTHER & CO., BOSTON, MASS.

EXCLUSIVE MANUFACTURERS OF THE OTIS

**Patent Steam Excavators,**
WITH CHAPMAN'S IMPROVEMENTS AND DREDGES.**DREDGES & SHOVELS**

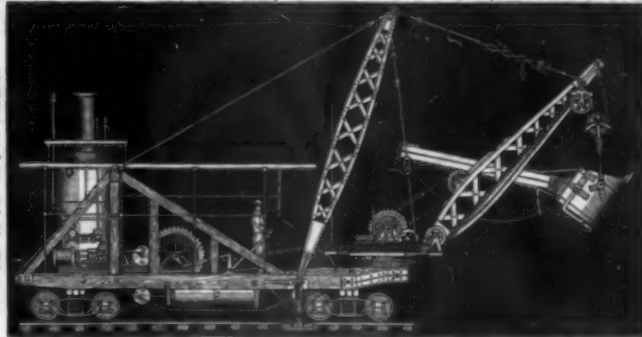
STEAM DREDGES.

STEAM SHOVELS.

—FOR ALL PURPOSES.—

Bucyrus Steam Shovel & Dredge Co.,
BUCYRUS, OHIO.**OSGOOD DREDGE CO., 37 State Street, Albany N. Y.**

No. 1—Weight, 40 tons. Capacity, 6 cubic yards per minute.



No. 2—Weight, 28 tons. Capacity, 4 cubic yards per minute.

STEAM EXCAVATOR AND DERRICK CAR
Aside from Our Standards (Nos. 1 and 2) we Build Machines of Special Design, or from any Drawings Furnished.**THE UNIVERSAL
RADIAL DRILL CO.,
CINCINNATI, O.,**

Manufacturers Exclusively of

'Universal' and 'Radial'

DRILLING

MACHINES,

to Standard Gauges.

Prices upon

application.

Correspondence

solicited.

Rock Drilling and Air Compressing**MACHINERY**

FOR

TUNNELS, QUARRIES, MINES, RAILROADS,

And Wherever Ore and Rock are to be drilled and blasted.

RAND DRILL CO.,

23 Park Place, NEW YORK.

**THE NEW HIGH EXPLOSIVE****RACKAROCK**

Furnished in two ingredients which are absolutely unexplosive until combined by the consumers, for which we furnish convenient means. Shipped and stored as ordinary merchandise. After combination the explosive is absolutely safe. By reason of its safety it is especially adapted to water-works construction in crowded streets.

Rendrock Powder Co.

23 PARK PLACE, NEW YORK.

MACHINERY FOR SWINGING**Draw Bridges.**

We have for several years made this one of our leading specialties, and solicit opportunity to submit prices.

VULCAN IRON WORKS,
CHICAGO.**MAXON Pat. JACKS**

Lever and Screw

Unequaled for all varieties of

RAILROAD WORK.

Our Drop Track Jack Beats anything of that line now in market.

MANUFACTURED BY

THE McSHERRY

MFG. CO.,

DAYTON, OHIO.

**SPECIAL NOTICE.**

Two handsome photo-engraved display sheets entitled:

"Recent Improvements in Air Compressors."

"Recent Improvements in Rock Drills."

Mailed free to any one who will cut out this advertisement and mail it to us with his name and address.

THE INGERSOLL-SERGEANT DRILL CO.,

No. 10 PARK PLACE, NEW YORK.

ILLINOIS STEEL COMPANY

Manufacturers of Bessemer Foundry and Mill Pig Iron, Spiegel and Ferro-Manganese; Iron and Steel Merchant Bar; Nails and Rail Fastenings; Light "T" and Street Rails; Steel Blooms, Slabs, Billets and Wire Rods of any required chemical composition; Iron or Steel Car Truck Channels; Steel "I" Beams and Structural Shapes. Rolls for Standard Sections and Shapes always in stock. Special Sections and Shapes made to order.

BESSEMER STEEL RAILS

FROM 8 TO 100 LBS. PER YARD.

This Company owns and operates five works, namely: NORTH WORKS and UNION WORKS, Chicago; SOUTH WORKS, South Chicago; JOLIET WORKS; MILWAUKEE WORKS.

JULIAN L. YALE, General Sales Agent,

General Offices,
"Rookery," Chicago, Ill.

Milwaukee (Wis.) Office,
151 N. W. Ins. Building.

New York Offices, 48 Wall Street.
D. E. GARRISON & CO., Agents, St. Louis, Mo.

THE SPRINGFIELD IRON COMPANY,

SPRINGFIELD,
CHICAGO OFFICE:
710-711 Phenix Building.



ILLINOIS,
ST. LOUIS OFFICE:
125 and 127 Laclede Building.

IRON AND STEEL SPLICE BARS.

Track Bolt, Merchant Iron and Bar Steel. The largest capacity and best facilities in the United States for making Angle Splice Bars.

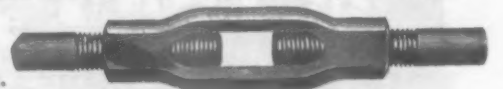
WROUGHT-IRON OPEN HEXAGONAL.

MADE FROM THE BEST CHARCOAL IRON.



TURNBUCKLES.

Guaranteed Stronger than any Similar Article on the Market.



Eastern Agents:
ANTHONY & McELROY, 328 Chestnut St., Philadelphia.
Western Agents:
H. L. GREEN & CO., 46 Lake St., Chicago.

The Only Buckle Made that has
a Perfect Wrench Hold.

The Central Iron & Steel Co.,
BRAZIL, IND.

CAMBRIA STEEL RAILS.

HEAVY RAILS, LIGHT RAILS AND RAIL FASTENINGS.
STEEL CAR AXLES. STEEL CAR CHANNELS.

ADDRESS: CAMBRIA IRON CO.,
Office, 218 South Fourth St., Philadelphia, Pa.
(Works, Johnstown, Pa.)
Chicago Office:
Phenix Buildings.

CHARLES HUSTON, Pres't. A. F. HUSTON, Vice-Pres't. C. L. HUSTON, Gen. Man.
R. B. HAINES, Jr., Sec'y. JOS. HUMPHTON, Treas.

LUKENS IRON & STEEL CO.

ESTABLISHED 1810. INCORPORATED 1890.
The First to Make Boiler Plates in America.
STEEL AND IRON PLATES.
Firebox Steel Plates a Specialty. We Can Roll Steel Circles 116 in. Diameter, or Rectangular Plates 114 in. Wide. Range of Thickness, from 1/4 to 1 1/2 in.



METCALF, PAUL & CO

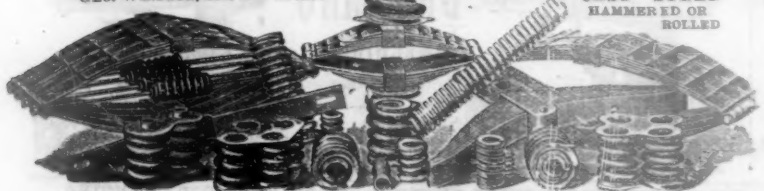
Make a Specialty of
SOLID STEEL
RAILROAD TRACK TOOLS.
ALSO SOLE MANUFACTURERS OF
THE PATENT
VERONA NUT LOCK
SEND FOR OUR NEW CATALOGUE
Western Warehouse:

1th Av. & LIBERTY ST., PITTSBURGH. 64 & 66 S. CLINTON ST., CHICAGO

THE FARIST STEEL COMPANY

JOEL FARIST, Pres't.
GEO. WINDSOR, Sec. and Treas.

Manufacturers of all descriptions of
CAST STEEL
HAMMERED OR
ROLLED



SPIRAL AND ELLIPTIC CAR SPRINGS RAILROAD AND MACHINERY FORGING.

CHICAGO: Bridgeport, Conn. St. Louis:
J. S. BREWER, 178 Jackson Street. J. H. WYETH, 221 Chestnut St.

AARON FRENCH, Chairman. GEO. W. MORRIS, D. C. NOBLE,
JULIUS E. FRENCH, Vice Chairman. Gen. Man'r. Sec. and Treas.

THE A. FRENCH SPRING CO. LIMITED

ELLIPTIC & SPIRAL SPRINGS

OF EVERY DESCRIPTION
NEW YORK: 88 Boreel Bldg. BOSTON: 52 Mason Bldg. CHICAGO: Phenix Bldg.

THE ATKINSON STEEL AND SPRING WORKS

CAR SPRINGS OF EVERY DESCRIPTION.

Cast Steel, Spring Steel, all sizes and grades. Railroad Spring Steel a specialty.

OFFICE: "Rookery" Building, Chicago, Ill. WORKS: Spaulding, Ill.

Passenger Car Ventilator.

ALL CINDERS, DUST AND DIRT EXCLUDED.
A SUPPLY OF FRESH AIR GIVEN.

PERRY VENTILATOR CO.,
L. F. BRAINE, Gen'l Sales Agent,
Room 30, 1311 Broadway, 131 Boreel Building, New York.

THOMSON'S SLOTTED RIVETS.

The only rivet in the world that can be set without a machine.

For fastening Belts, Straps and other articles made of Leather, Rubber, Canvas, Felt, Pasteboard, Sheet Iron or Wood.

SIZES 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, No. 9 Wire Gauge.

SIZES 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, No. 6 Wire Gauge.

JUDSON L. THOMSON MFG. CO.,
WALTHAM, MASS.



WILLARD L. CANDEE and H. DURANT CHEEVER, Business Managers.

THE INTERNATIONAL OKONITE COMPANY

LIMITED.
13 Park Row, New York.
INSULATED WIRES AND CABLES

FOR AERIAL, SUBMARINE AND UNDER GROUND USE.
SOLE MANUFACTURERS OF
CANDEE AERIAL WIRES.
MANSON PROTECTING TAPE.
OKONITE WATER-PROOF TAPE.

BRANCHES: Chicago, Philadelphia, Boston, San Francisco, Cincinnati, Louisville, Omaha, Minneapolis, St. Louis, Kansas City, London, South America.



CURTIS RETURN STEAM TRAP.

Cheapest, Most Durable, Most Powerful. Have stood the test of Seven Years. WITHOUT EQUALS.

OUR PATENTS:—Damper Regulators, Steam Pressure Regulators, Pressure Regulators for Steam, Water and Air; Steam Traps, Return Traps, Separators, Balanced Steam Traps, Thermostatic Damper Regulators for Residences and Public Buildings, and other Specialties for the Use and Saving of Steam.

FULL INFORMATION CHEERFULLY FURNISHED BY

THE CURTIS REGULATOR CO.
63 BEVERLY STREET, BOSTON, MASS.

GENERAL AGENCIES:

NEW YORK, 109 Liberty St. PHILADELPHIA, 205 N. Front St. CHICAGO, 218 Lake St.
DENVER, Col., Amphie Building.

FOUR GREAT FEATURES

One Man Can Hoist 4 Tons.

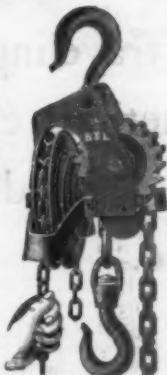
Holds the Load at any Point.

Lifts and Lowers the Load

Quicker than any other

Hoist Made.

The Best Hoist on Earth.



BATT'S PATENT IMPROVED DIFFERENTIAL

... PULLEY BLOCKS ...

Medal of Merit, American Institute, New York, 1883.

Silver Medal and Diploma, Franklin Institute, 1885.

Gold Medal, Mass. Charitable Mechanics Ass'n, 1890.

Do not worry yourselves with imperfect Hoists. Write at once. Full information cheerfully furnished by

The Boston and Lockport Block Co.,
162 Commercial St., Boston, Mass.

Always use "Star Brand" Tackle Blocks—Most powerful and durable made. Load's Patent Hand Power Hoists—Pumps water containing everything but rocks.

NEW YORK BELTING & PACKING CO.



JOHN H. CHEEVER, J. D. CHEEVER,
F. CAZANOVE JONES, Managers.

WM. T. BAIRD, Secretary.

Oldest and Largest Mfrs. in the U. S. of

VULCANIZED RUBBER FABRICS

For Mechanical Purposes.

RUBBER BELTING AND PACKING.

Westinghouse Air Brake Hose.



Bucket Plunger Pump



AND BOILERS

FOR RAILROADS

Valley Pump Co.,

EASTHAMPTON, MASS.

LIFTING ENGINES of any power

DOUBLE AND SINGLE, WITH Improved



Patent Friction Drums Especially adapted for Bridge building, Dock Building, Pile Driving, Coal Hoisting, quarries, mines, etc. This patent has been sustained in the U. S. District Court, Southern Dist. of N. Y., by Judge Wheeler. Also by Judge Nix on, in U. S. Circ. Court, Dist. of N. J.

J. S. MUNDY.
224 24 Prospect St.

NEWARK, N. J.

AUTOMATIC Water Columns. TANK VALVES.



JOHN N. FOAGE
Cincinnati, O.

UNION IRON WORKS,

SAN FRANCISCO, CAL.

Only Iron and Steel Ship Builders on Pacific Coast.

MINING MACHINERY

A SPECIALTY.

HYDRAULIC LIFT DOCK

Important to Railroad Managers and Master Mechanics.

SIBLEY'S

PERFECTION VALVE OIL.

More perfect lubrication insured, and entire freedom guaranteed from corrosion of cylinders and destruction of steam joints by fatty acids.

In exclusive use on 50 railroads.

References and prices furnished upon application.

Make exclusive specialty of the Manufacture of Valve and Signal Oil for Railroad use.

SIGNAL OIL WORKS

(Limited).

FRANKLIN, PA.

J. C. SIBLEY,

PRESIDENT.

STOW FLEXIBLE SHAFT,

For Tapping and Reaming Stay Bolt Holes in Boilers.

Portable Drilling



STOW MFG. CO., Binghamton, N. Y.
Inventors and Manufacturers of the Stow Flexible Shaft for all purposes.

Stow Flexible Shaft Co., Limited,

26th, Callowhill and Biddle Sts., Phila., Pa.
Manufacturers of

FLEXIBLE SHAFTS,

And all kinds of Machines to be used with them. Portable Drilling, Tapping, Reaming and Boring Machines. Also Portable tools for every wheel grinding, metal and wood polishing, cattle brushing and clipping, etc.

Builders of Special Machines for railroads, Bridge and Hoiler Makers, Contractors, etc.

Freight Elevators,

Steam and hydraulic, completely equipped; or iron work only.

THE LANE & BODLEY CO.,
CINCINNATI, O.

THE LAIDLAW & DUNN CO.



NEW DEPARTURE IN RATCHET DRILLS
SCHUTTLER MFG. CO.

FRANK BAKEMAN & CO., 6 Rotunda, Rookery, Chicago, GENERAL AGENTS.
AVERY & WEST, 450 Rookery, Chicago, WESTERN AGENTS

The movement of the handle in either direction causes a continuous drilling, thus doing the work in half the time of any other ratchet drill without additional labor. The drill is strong, durable and easily operated, the working parts being completely protected from dust and weather.

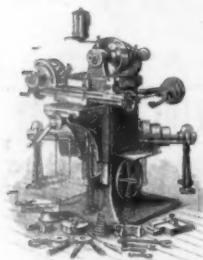


R. D. WOOD & Co. Engineers,
Iron Founders,
Machinists,
PHILADELPHIA, PA.

**CAST IRON PIPES.
HYDRAULIC TRAVELING CRANES.**

Hydraulic Cranes, Presses, etc. Hydraulic Car and Freight Lifts
HEAVY LOAM AND MACHINERY CASTINGS.

BROWN & SHARPE MFG. CO.,
PROVIDENCE, R. I.



Milling Machines,
Grinding Machines,
Turret Head Machines,
Lathes.

Fifty machines for working iron and steel and a large assortment of Gauges and Small Tools for machinists' use carried in stock. Catalogue mailed on application.
Special Machines for **MILLING LOCOMOTIVE PARTS** Made to Order.

USE THE *Mason*
Pressure Regulator
FOR STEAM PUMPS

**On Your Air
Brakes.**

The Pennsylvania, Rock Island, R. & D., Boston & Albany,
Fitchburg, and other large systems use them.

MASON REGULATOR COMPANY,
BOSTON.

PURE ALUMINUM.

The Pittsburgh Reduction Co., 35 Fifth avenue, Pittsburgh, Pa., offer Aluminum guaranteed to be equal in purity to the best in the market at the lowest rates obtainable. Prices given on application. Aluminum sheet, wire and castings at best rates.
Aluminum polish, very efficacious and non-poisonous, suitable for household use as well as for manufacturing purposes.

ALUMINUM SOLDER.

CORRESPONDENCE SOLICITED.

Facts on Varnish.

NO. 89.—VARNISH CAN EARN A DIVIDEND.

Whether cars are shabby or bright has nothing to do with road-bed, bridges, grades, curves, motive-power, safety and speed, but it stands for all these in the eye of the traveling public.

Whether cars are shabby or bright depends on whose varnish you use.

MURPHY VARNISH COMPANY.

FRANKLIN MURPHY, President.

Head Office: Newark, N. J.

Other Offices: Boston, Cleveland, St. Louis and Chicago.

Factories: Newark and Chicago.



A train of cars nearly 2000 miles long!!
could be made up of
cars already fitted with the **DUNHAM CAR DOOR**.
Now in use on half the U.S. roads.

WHY?
Because they are
Simple, Cheap and easily operated



ARTIFICIAL STONE AND ASPHALT PAVEMENTS
ESPECIALLY ADAPTED FOR REFERENCES:
RAILWAY STATION PLATFORMS, PENNSYLVANIA RAILROAD CO.
ROUND HOUSES, FLOORS IN SHOPS, ETC. ADAMS EXPRESS CO.
WEHN PAVEMENT CO.,
16 & 18 EXCHANGE PLACE NEW YORK

TRAUTWINE'S POCKET BOOK.

"Without doubt it has proved itself to be the most useful handbook in the language for the engineering profession."—*Engineering and Mining Journal*, Aug. 25, 1888.

JOHN WILEY & SONS, New York.

E. & F. N. SPON, London.

SPRAGUE, DUNCAN & HUTCHINSON,
Limited.

FRANK J. SPRAGUE,
LOUIS DUNCAN, Ph. D.,
ALFRED BISHOP MASON,
CARY T. HUTCHINSON, Ph. D.

CONSULTING ELECTRICAL ENGINEERS.

15 WALL STREET, NEW YORK.

H. W. JOHNS'



**Asbestos
Sectional
Pipe
Coverings.**

Non-Conducting Coverings for Steam and Hot Water Pipes, Boilers, etc.

READILY ATTACHED OR REMOVED BY ANY ONE.

ASBESTOS BOILER COVERINGS.

We are prepared to take contracts for applying Steam Pipe and Boiler Coverings in any part of the United States.

H. W. JOHNS MANUFACTURING COMPANY,
Sole Manufacturers of H. W. Johns' Asbestos Millboard, Sheathings, Building Felts, Fire-Proof Paints, Liquid Paints, Asbestos Roofing, etc.
87 MAIDEN LANE, NEW YORK. CHICAGO, PHILADELPHIA, BOSTON, ATLANTA.

LOUISVILLE STEAM FORCE CO



CAR AND LOCOMOTIVE AXLES.



MERCHANT BAR AND FORGED IRON.
Draw-bars, Link and Pins, Follower Plates, RAILROAD FORGING
Arch Bars, Splice Bars, Track Bolts, Bridge Rods with
Plain or Upset Ends, All Sizes.

OFFICE AND WORKS:
SHIP AVENUE, COR. SIXTH. LOUISVILLE, KY.



BE'L CORD AND COUPLING.

Solid Braided Cord for Railroad Service.
SAMSON CORDAGE WORKS.

SEND FOR SAMPLES.

115 CONGRESS ST., BOSTON.

EDWARD SMITH & CO., RAILWAY VARNISHES, Times Building,
NEW YORK.



FRIDAY, JAN. 20.

CONTENTS.

ILLUSTRATIONS:	PAGE.	GENERAL NEWS:	PAGE.
Track on Curved Bridges...	73	Locomotive Building.....	58
Electric Cranes—Baldwin	74	Car Building.....	58
Locomotive Works (asset)	74	Bridge Building.....	58
The Stewart Avenue (Chicago)	75	Meetings and Announcements.....	58
Interlocking.....	75	Personal.....	59
Proposed New Formula for	76	Elections and Appointments.....	59
Yellow Pine Posts.....	76	Railroad Construction.....	59
Mosler's Three-Position Sem-	78	General Railroad News.....	59
aphore.....	78	Traffic.....	59
Portable Drilling Machine.....	79		
The White Journal Box.....	79		
Details of Freight Car Con-	80		
struction.....	80		
CONTRIBUTIONS:			
Track on Curved Bridges...	73		
Argument of a West Shore	78		
Telegraph Operator.....	78		
EDITORIALS:			
Car Service Settlements.....	82		
Some of the Troubles of	83		
Operators.....	83		
Train Accidents in 1891.....	84		
Pig Iron and Steel Rail Pro-	84		
duction in 1891.....	84		
EDITORIAL NOTES.....	82-84		
NEW PUBLICATIONS.....	85		
TRADE CATALOGUES.....	85		

Contributions.

Track on Curved Bridges.

CHICAGO, Ill., Jan. 3, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

We are always boasting of our progress in bridge building, but there is not yet a rational method in obtaining the elevation for track on curved bridges. Let us examine the various plans:

1st, wedged shaped ties, thick at one end and thin at the other, necessitating a large quantity of material on a sharp curve; 2d, a block of wood under the high rail, securely fastened by means of bolts and spikes, and 3d, having the block on top, a very objectionable arrangement, especially in case of derailment. I think the proper method would be to raise and lower the track stringers, as shown by sketch. This method would allow the regular standard ties to be used. Don't you think some of our engineers ought to try it?

ELI MEWOL.

Argument of a West Shore Telegraph Operator.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A short time since it was my pleasure to read an article by our Division Superintendent in relation to the train service. [Railroad Gazette, Nov. 20, 1891.] Very naturally our thoughts return to our own department (the telegraph) for comparison, to see what one or more of the new ideas which he presents can be applied to us. To me it seems strange that considering the large number of successful railroad managers who have risen from operators to positions of rank and authority no effort has been made by them to place the telegraph on a more reliable and sound working basis.

When we consider the part which the telegraph has taken in the rapid extension and development of the railroad systems and try to imagine the telegraph left out of the development, we can understand how it is the life of the railroad. But what state of affairs do we find? That by reason of the very small and unreasonable salaries paid to operators (very often less than \$40, sometimes less than \$35 per month, and seldom over \$40), only a poor class, on the average, have entered the service and to-day the fact that you are an operator is sufficient cause for being looked down upon. Just think of it! Forty dollars a month for from 12 to 16 hours work for seven days every week. For this salary the operator must be thoroughly competent to handle train orders, telegrams of the greatest importance in the handling of

life and property. Generally his duties are those of an agent, and as such he has to cover several departments intelligently. If he neglects to secure some large consignment of freight, or to catch a party for the "personally conducted," etc., vestibuled trains, there will be war from both sides of the traffic department. If in a hurry in performing the duties of baggage master, he should mismatch a check, he will have several opportunities for explanation. While doing these duties the dispatcher has been calling vigorously for the purpose of giving orders to help a train at another point. If, in the mean time, the operator has not watched the wire to see what orders are out, and consequently has failed to detect an error made by the overworked dispatcher, he is accused by the coroner's jury as an accessory to crime.

A track laborer makes \$1.40 for ten hours work. He has only to follow the directions of a foreman. If he works Sunday he gets paid for it, or if called out to clear wrecks, etc., he is paid proportionately; and his pay is equal to the operator's, while he did not have to spend months or years in acquiring his trade. The operator gets \$40, but he has averaged 14 hours per day with not a cent for overtime and nothing for Sundays. He does not get even thanks for remaining on duty with a wreck and a feeble remonstrance is met with a gruff reply that "if you don't like it, you know what you can do." This is the reward after serving the company for years with the knowledge, that "All employees shall be considered in line of promotion, advancement depending on length of service and capacity for increased responsibility."

The engineer (who carefully observes the operator's block and other signals and whose life wouldn't be worth an expired time order if a single character or letter were omitted from the order which he gets from the \$40 operator) will draw more money the second year by reason of a graded service, and if it is his "right" he gets the next passenger run. His conductor considers himself fortunate in being "grouped" with the fast freight crews, and he may possibly catch a few excursions in their season. By the use of a correct working basis for train crews the service is benefited more than can be calculated by dollars and each man knows what his standing is for promotion, depending on faithful service.

Yet neither position to which I have referred is more important or involves a particle more responsibility than the \$40 operator. Is it any wonder that operators lose interest in their work, and that the company eventually loses more money than the operator asks for as a reasonable compensation?

Would it not be well to consider the plan of our superintendent for classifying and grouping the trainmen, and apply it to the telegraphers? Why not something like this: Let those operators who are able to receive and transmit ordinary messages and work a block signal comprise one group at a uniform salary for the first year. At the end of one year, if no promotions are made and it is evident that there is an effort or desire for higher work shown by the men qualifying themselves for it, let there be an increase. Let there be another group who, having served in Group 1 and qualified for higher service, are capable of handling train orders and ordinary messages rapidly and safely, and who are posted on general station duties, yard-office work, work at relaying, terminal or junction points. There should be not less than ten dollars per month increase over the first group, and at the end of another year an increase to stimulate them to further and higher qualifications, as well as a recognition of faithful and continued service. The third group naturally follows by promotion from the second, and should include managers of relay offices, circuit managers, relief agents, tunnel block men, dispatchers, assistants, interlocking tower men, and those who are serving in the second group and are qualified to fill any of these positions when the opportunity presents itself. There should be an increase of at least \$10 over the second group rate. Operators in this class would, however, have considerable incentive to keep well up in their work by those crowding from below, so that an increase would hardly be necessary after a term. In addition to this there should be an allowance for overtime and extra for Sundays in all the classes.

Any one can readily see to what state of perfection the telegraph department could be brought by a course of discipline something after this plan. It is the best plan to overcome the striking propensities of some operators.

The question naturally arises as to what would be a reasonable salary for a starter in group 1. When we consider that it is from this class that future promotions to the second and third groups are made, it is seen that they should be at least of ordinary intelligence, or, in other words, possess the crude material of which our future officers are to be made, coming up through the various stages of development. It could hardly be expected to obtain such men for \$40 per month.

AJAX.

Electric Cranes with a Special Reference to one in use in the Baldwin Locomotive Works.

BY C. J. BATES.

[WITH AN INSET.]

The use of electricity, as a motive power for cranes, is attracting much attention on account of its facility of application, range of power and speed, and delicacy of touch, if we may use the expression. The last is of great

importance where very gentle movement of heavy masses is necessary, as in the foundry, where heretofore only hand power cranes were considered practicable.

In the following the writer endeavors to convey a general description; but special reference is made, where particulars are necessary, to the 100-ton cranes built for the Baldwin Locomotive Works, by Messrs Wm. Sellers & Co. Such description is made as complete as possible without reference to detail drawings.

Generally speaking the crane consists of a bridge composed of two parallel girders supported at each end on tracks, on which it can be made to move from point to point as may be desired. The hoisting trolleys, which are carriages containing the drums with necessary gearing are supported on rails that rest on the lower flanges of the girders. As it is impossible to use lower lateral bracing, owing to the necessity for clear space, the tendency of the trolleys to produce an outward thrust of the lower flanges of the girders, is met by braces that extend from these lower flanges to the top cross struts, which extend beyond the girders for that purpose, as shown in the cut. In addition to the above top lateral struts are angle iron lateral braces of the usual form. The only vertical stiffening is from the outside braces mentioned.

The girders are designed to support the greatest load that may come on them from any position of the trolleys, with special reference to stiffness. The engraving shows the number of stiffeners used on the web. The ratio of depth to span of girder varies for different conditions of location. In the Baldwin shop the span of the bridge between centres of supporting rails is 74 ft. 8 in., and the girders are 7 ft. deep, out to out of flanges. From centre to centre of webs the girders are placed 9 ft. 3 in. apart. The bridge is carried by four 5 ft. wheels with double flanged steel tires, which run on the supporting rails mentioned, with a wheel base of about 14 ft. The rails were made especially for this case, and weigh 300 lbs. per yard, being 6 in. high, with 4-in. tread, 6-in. base and 1-in. web. Securely bolted to the rail and runway is a rack, 2½-in. pitch and 4-in. face, into which the driving gears are meshed.

Ordinarily, where the objects to be lifted are not too bulky to be supported at one point, one hoisting trolley may be used on the bridge. But in this case, where the lifting of such a mass as a locomotive requires it to be raised at both ends simultaneously, it is necessary to use two trolleys which run on the rails supported by the lower flanges of the girders. The hoisting trolleys are, each in itself, complete hoisting machines, to which power may be applied without reference to its source.

In the cases considered the immediate source of power is the dynamo. From the dynamo the electric current is conducted to two 7/8-in. copper rods, supported by yellow pine strips, which are insulated by glass. On these rods run two four-wheeled trolleys of the "Wheeler type." It is thought by the makers that wire cables are better than the rods, as the latter are inclined to buckle under expansion, while the cable could sag between supports, to which there is no objection. It is also suggested that the current be supplied to the rod or cable at various points instead of being carried by it all from one end.

The "Wheeler" trolleys are each connected to a 40-H. P. U. S. Electric Light Co.'s motor, shunt wound, constant speed, for 220-volt current. These two motors, running at 500 revolutions per minute, stand on the top of the bridge over the operator's platform and are belted to the systems of gearing below, that operate the hoisting trolleys. The two systems, one for each trolley, are set one on each side of the bridge, and are connected by a belt across the bridge. The advantage of this connection is as yet an unsettled question, for in the event of one motor running at a higher speed than the other from any cause it might make the other motor act as a dynamo, throwing current back into the cable and probably result in burning the stronger motor. The cross belt is in use, however, in Baldwin's shop without deleterious effect.

The systems of gearing on each side, driven by the 40-H. P. motors, consist essentially of a combination of gears, with clutches for stopping and starting and reversing, and for two changes of speed. These systems are connected with the hoisting trolleys by three square shafts to each trolley, running in movable hangers which allow the trolleys to pass them. These shafts operate the gearing for hoisting and lowering, for traversing the trolley, and a clutch for giving two changes of speed on the trolley. This gives on each trolley four changes of speed for hoisting or lowering, as follows: 5, 10, 20 and 40 ft. per minute, and two changes of speed for traversing the trolley, of 50 and 100 ft. per minute.

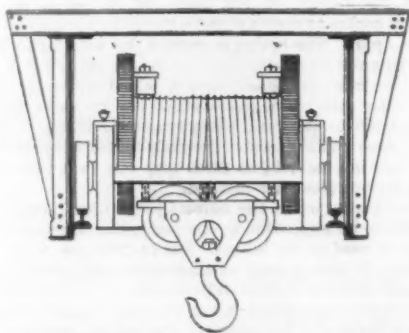
The two hoisting trolleys are entirely independent of each other. The driving shaft, across the top of the trolley, which is operated by one of the square shafts mentioned, is connected with the drums, through an intermediate shaft, by gears of two sizes, to either of which it may be connected by a clutch, giving the two speeds before mentioned. On the intermediate shaft is a special clutch that by its action holds the weight at any point until released by the driving power, either in raising or lowering, so there is no possibility of the apparatus lowering with a "run," when either changing direction or from one speed to another.

The drum is composed of two parts, mounted on the same shaft, one part keyed and one loose. Both parts are geared to the driving shaft, and must run together.

The object in making one loose on the shaft is to allow for any slight play, and thus prevent straining. The cut shows the vertical lateral stiffening and drums, with hoisting blocks, other details omitted.

The hoisting block has two sheaves, as shown in the cut. The chains are in two parts, each wound on separate parts of the drum; the winding running toward the middle, so there is no tendency to side pull either way, so the object lifted rises in a truly vertical line, a very important consideration in foundry work. The capacity of the hoisting trolleys is 100,000 lbs. each, but it is not expected that the higher speeds will be used with any loads near the full capacity. On the "far trolley," so called, is a separate drum and hoisting chain operated by a 5-H. P. Westrom motor, series wound, variable speed, fed by a cable that hangs in festoons on the side of the bridge, as may be seen in the picture. This auxiliary drum is very useful in handling lighter weights when the large drums are engaged.

The arrangement for moving the crane, as a whole, is operated by the 40-H. P. motors, and is located on the far side of the bridge as shown in the picture. This arrangement has two speeds, by which the crane may be traversed at 100 or 200 ft. per minute. On the operator's platforms are nine levers; six of these are for the hoisting trolleys, *i. e.*, two for hoisting or lowering; two for traversing and two for change of speed; the three remaining levers are for stop, start and change of speed of traverse of the whole crane. The above levers are, as far as possible arranged to move in the direction of the motion intended to be produced; so the first impulse of the operator's mind is in the right direc-



tion. The rheostat and switches are placed in a box at the side of the bridge.

Special remark should be made on the clutches in use on these cranes. The ordinary form of conical clutch consists of a conical piece, usually with a wood face, running in a metal flange of a corresponding shape, so that when pressed together, friction on the conical surface holds them. In cranes with even as slow a motion as five feet per minute a very gentle start or stop is frequently of great importance. To accomplish this it is necessary to let the clutches slide a little before taking a firm hold, the pressure uniformly increasing until a firm hold is secured, as is done in the case of a cable car grip. It has been found that with a conical clutch the heat developed by the friction of first pressure and sliding caused the outer metal part to expand to an increased diameter, thus again loosening the clutch. This either checked the increasing speed of motion or even allowed a backward movement, that in handling delicate sand molds might result in serious consequences. This necessitated the designing of a clutch in which a change of shape within reasonable limits would not affect its holding power whether the parts were firmly bound and moving together, or whether one part produced a constantly accelerating or retarding effect on the other. This result has been very successfully secured.

Car Service—Per Diem and Mileage.

A meeting of the Committee on Car Service of the American Railway Association was held at the Iroquois Hotel, Buffalo, on Thursday, Jan. 21, the following members being present:

Mr. Theo. Voorhees, General Superintendent, N. Y. C. & H. R. R. R., Chairman; Mr. S. M. Prevost, General Superintendent Transportation, P. R. R.; Mr. H. F. Royce, General Superintendent, C. R. I. & P. Ry.; Mr. W. H. Canniff, General Superintendent, L. S. & M. S. R. R.; Mr. C. H. Hudson, General Manager, E. T. V. & G. Ry.; Mr. W. G. Collins, General Superintendent, C. M. & St. P. Ry.; Mr. F. Huger, General Superintendent Transportation, representing Mr. J. H. Sands, Vice-President and General Manager, N. & W. R. R.

The Per Diem Committee of the International Car Accountants' Association held a meeting at Buffalo on the previous day and joined with the Committee of the American Railway Association in a general discussion of the "per diem" question on the 21st. There being present from the Car Accountants' Committee the following gentlemen: G. S. Russell, C. A., B. C. R. & N. R. R., Chairman; H. Sleight, C. A., Vandalia Line; A. Hale, C. C., Car Record Office, P. R. R.; F. E. Higbie, G. C. Agt., C. R. R. of N. J.; Asa P. Blakeslee, G. C. Agt., Lehigh Valley R. Ry.; W. W. Wheatlev, C. A. West Shore R. R.; W. W. Halsey, W. N. Y. & P. R. R.; T. F. Brennen, G. C. Agt., B. R. & P. Ry.; H. R. Payne, Secy., Union Tank Line.

A full and free discussion of the present situation in regard to the settlement of car service was held and it developed a marked unanimity of opinion on the part of all those present in favor of adopting the mixed mileage and per diem plan, which had heretofore been recommended by the Committee of the American Railway Association, with some slight modifications.

Mr. C. H. Hudson, General Manager of the E. T. V. & G. Ry., some time since, in a communication addressed to the General Time Convention, had pointed out the difficulty in the way of the adoption of the "per diem" plan as then recommended by the committee. The average mileage per car per day on all roads in the United States, according to the best information that is to be obtained, is now about 24 miles. At the existing mileage rate of three-quarters of a cent per mile this produces an expense of 18 cents per day. Mr. Hudson argued that it would not be feasible for the railroads who were borrowers of equipment to go into any "per diem" plan, unless they could see that their average expense would not in any way be increased by so doing. In order to accomplish this, it becomes necessary to reduce the "per diem" to six cents per day, the mileage rate being reduced to one-half cent per mile. At those figures, the mixed plan will not involve any increased expense and will, no doubt, be more acceptable to a large number of roads.

These views originally presented by Mr. Hudson were fully discussed by the meeting in Buffalo and resulted in a general agreement of opinion on the part of those present, that the rates as suggested above would be equitable and should be recommended to the American Railway Association.

Another opinion that has heretofore been a stumbling block in the way of the general adoption of the mixed plan of car service was the question of co-operative line cars. It is customary for very many roads west of Chicago and St. Louis to receive large numbers of line cars during the greater part of the year and hold them in anticipation of shipments eastbound. The payment of "per diem" on such cars would be very burdensome and expensive, and this has stood in the way of the adoption of this plan by many roads so situated. After full and careful consideration of this point, the meeting concluded that it would be better to recommend that all such cars should not be subject to "per diem," but that settlement for them should be continued on a mileage basis.

The steadily increasing number of private cars and cars owned by firms or companies, other than railroad companies, was the subject of careful consideration. At present, as is well known, there are very many lines of cars in service running over different railroads in the country, on which the mileage at the present rate of three-quarters of a cent per mile is equivalent to a return on the investment of from 35 to 50 per cent. per annum. Such large profits for the use of cars have stimulated their production in a marked degree. Firms and companies controlling any considerable volume of freight find it for their interest to own the cars in which their business is carried and by so doing are, in very many cases, enabled not only to dictate to the railroad companies the rate of freight they are willing to pay, but also the rate of mileage they must have for their equipment. It has resulted not only that cars for the movement of live stock, dressed beef, and other freight requiring cars of special construction, are now wholly owned by individuals or private companies; but also a large number of such cars are being used by railroad companies for coal, coke and other coarse commodities. To such an extent is this now being carried that cars are being paid for by railroad companies in very many directions, when the cars owned by the companies which would be perfectly fit and suitable for carrying the business, have to stand on sidings. The Committee came to the conclusion that the only way to check this growing evil would be by a reduction of the mileage earnings on such cars, and after full discussion they came to the unanimous opinion that they would recommend to the American Railway Association that the mileage on all cars owned by individuals, firms and private companies, and also on co-operative line cars, should be reduced to one-half cent per mile, and that no *per diem* be allowed on any such cars. It may be urged that very many railroad companies have made long time contracts with individuals and special shippers in regard to mileage to be paid for the use of their equipment. Granted that this may be true, there is still no reason why the railroad companies, as a whole, should not agree and unite upon a general reduction in the mileage rate for such cars. It is certainly only by some such action that the present tendency on the part of shippers to insist upon the use of their own cars can be checked.

The above represents the main points of the discussion, after which the special committee of the American Railway Association held an executive meeting and agreed upon a form of report, which will be published and distributed to all railroad companies within the next few days. It was agreed by all that the present was a favorable time for the consideration of this question. There has probably not been in many years so great a demand for cars as existed during the past fall and the indications are that the railroad companies will have all they can possibly do with the existing equipment for months to come.

The general spread of the system of car service asso-

ciations at junction points and the application of car service rules at local stations on so many roads, it was reported on all sides, had produced most beneficial results. Cars have never been unloaded so promptly as during the past year and many roads reported considerable economy in switching and yard service as one of the results of the enforcement of these rules. At the same time, the complaint is general that as yet nothing has been accomplished by the railroad companies, either individually or as a whole, to prevent the misuse and diversion of foreign cars. Car service rules, when properly enforced, will release the loaded car without delay, but at present there is no incentive to any transportation man to expedite the return home of the empty foreign car.

It was the belief generally expressed by those at the Buffalo meeting that the operation of the "per diem" plan would be a long step toward the removal of this particular abuse. Even so small a sum as six cents per day, when multiplied by the large number of foreign road cars in use on almost all lines, would prove a very considerable incentive toward the establishment of such methods in the routine handling of empty cars as would bring about a prompt return in the proper direction of all foreign equipment.

The meeting was of the opinion that it would be desirable to bring about a general adoption of this mixed plan with the opening of the next fiscal year, July 1, 1892, and to enter into an agreement among all companies to try this method of settlement of car service balances for twelve months. It was suggested that it was not necessary that all roads in the United States should agree to this. Very many roads might be willing to try this experiment, provided the roads with which they have immediate connection or with which they had the greatest volume of interchange should agree to do likewise. It is proposed, therefore, by the Buffalo meeting to ask the managers of the various roads, first, whether they will be willing to adopt and try the "per diem" plan for one year from July 1 next, if all roads agree, and, second, if they will be willing to do so if certain of their connections would agree, and asking each road to name those of their connections with which they would be the most interested. It is hoped that the responses to this circular will be prompt and general, so that the matter may be fully condensed and put in proper form to be submitted to the coming meeting of the American Railway Association.

There were several minor points discussed at the meeting in regard to proper application of these rules, but the above is a summary of the more important action taken.

The Stewart Avenue (Chicago) Interlocking.

In our issue of April 24, 1891, appeared a plan of the very complicated system of railroad crossings in Chicago known as the Stewart Avenue, the Canal and Sixteenth street and St. Charles Air Line crossings. There, within an area included in a circle with a radius of less than 1,500 ft. is one of the busiest and most complicated networks of railroad crossings in the world. The best method of dealing with this locality has been under consideration for a long time, and it is now proposed to operate the crossings by three interlocking towers, with the necessary signals and other safety equipment. The contract for the Stewart Avenue crossing was recently let to the Union Switch & Signal Co., and we show a plan of the tracks and arrangement of signals for that situation. The following description of the plant is contained in a letter written to us by Mr. George H. Paine, General Agent of the Union Switch & Signal Co., and as we cannot easily improve upon his description we shall not attempt to paraphrase it. The machine which he mentions is, it will be understood, the Westinghouse electro-pneumatic apparatus, which has often been described in our columns.

There are 84 signals on the plan, 37 single switches, 22 double slips, 22 movable frogs, all of them worked from a machine having 48 working levers and six spare spaces. If the attempt were made to do this work with a mechanical machine it would require, according to American practice, a machine of 187 working levers, which would occupy a floor space in the tower of 14 x 77 ft. If a mechanical machine of the English pattern, worked out according to their ideas, were used, there would be 243 working levers in it, which would require a floor space of 17 x 93 ft. There is no practicable place on the ground for putting a tower of that size. The pneumatic tower will be only 34 x 12 ft., which gives a large amount of extra room, as the machine will occupy a floor space of only 24 x 5 ft. There are on the plan 197 signalled routes, and in addition to the routes which are signalled there are 103 for which there are no signals, but which are possible. There will be nearly 10,000 ft. of detector bars required, which, according to the best of my knowledge, is the largest amount ever worked from any one machine.

It will, I believe, be understood that great care has been used in designing this work, which has to a large extent been done by Messrs. Corthell and Wallace, of Chicago. The plan is the outcome of several years work by the most competent men on the different railroads concerned, and it is hoped and believed that it will to a large extent simplify and make more safe the operation of this most difficult system of tracks. I would like to

Comparative data of the work done by the Minneapolis St. Paul Association is not nearly so complete as the above, the principal reason being that, while all commodities are subject to the Lake Superior Association, at St. Paul on account of two roads being outside the Association, a number of articles are not subject to car service and trackage charges. Then the number of these articles has been changed from time to time at the request of association roads which compete with non-association roads. Again in 1890, a car of a non-association road was not subject to the rules of the Association at any time, while now it is subject as soon as it reaches the tracks of one of the association lines.

In Minneapolis nearly 50 per cent. of the business is grain, handled under the following special rules, which are necessitated by the peculiarities of the Minneapolis market:

On and after Sept. 15, 1891, the rules for disposition of and handling wheat, flax and coarse grain received at St. Paul, Minneapolis and Minnesota Transfer will be:

1. For all wheat, flax and coarse grain received on or before 9 a. m. disposition shall be given not later than 4 p. m. same day; provided, inspection on same is reported at the office of chief train inspector before 12 m.
2. On all cars loaded out of an elevator, and inspected (if same are to be inspected) up to 6 p. m., disposition shall be given not later than 4 p. m. the following day.
3. If disposition is not furnished as above, cars will be subject to a trackage and car rental charge after 4 p. m. day of arrival, or 4 p. m. following day if loaded at an elevator as follows: \$2 per car per day for the first five days; \$4 per car per day for each succeeding day or fractional part of a day.
4. An elevator or mill, having more grain on track than it can receive in one day, shall be subject to a trackage and car rental charge, as in rule 3.
5. When an elevator has more grain on track than it can unload in two days, grain receivers shall be notified that orders sending cars to such elevator will not be accepted. The notice to be signed jointly by the Elevator company and Chairman of this Association and posted in the Chamber of Commerce.
6. If local freight agents are notified on day of inspection, one day will be allowed free of trackage and car rental on cars of grain received from country stations, on which re-inspection is called, provided a change in grade is allowed by the state inspector.
7. On all cars for which disposition has not been given, as above, a notice or bill for trackage and car rental shall be presented by the railway company not later than 3 p. m. the following day.
8. Agents shall not accept disposition until trackage and car rental is paid.
9. On all cars of grain, delivered for transfer to the mills, and not unloaded 36 hours after being placed on transfer track (Sundays and legal holidays excepted), a charge for trackage and car rental will be made as in Rule 3, to be paid by the party to whom grain is delivered.
10. On all cars of grain ordered to an elevator and "run through" and not unloaded on account of no orders having been furnished elevator company, a charge of \$3 per car per day will be made.

ROBT. DUDGEON, Chairman.

From July 15 to September 15 the charges under Rule 3 were:

- \$1 per car per day for the first three days.
- \$3 " " " next two "
- \$5 " " " for each succeeding day or fractional part of a day.

The rate, which was put into effect on Sept. 15, was made necessary by the enormous crop to be handled and the necessity for an additional incentive for immediate unloading of cars.

The railroad commissioners of the state of Minnesota in July addressed a circular to the general managers of the railroads, "with reference to a uniform and thorough system for the distribution of cars among the several stations and shippers upon their respective lines of road." This circular calls attention to the shortage in previous years of transportation facilities, and refers to the rules, under the existing laws, for furnishing cars, calling particular attention to the prevention of discrimination, and further suggests that instructions be issued to agents for their guidance. The 6th suggestion is: "A demurrage charge should be rigidly collected when cars are held an unreasonable time for loading or unloading." All of these causes have more or less influence in rendering the records of less value from a comparative standpoint. It must not be too hastily assumed that the time consumed in handling grain is excessive. All grain is subject to state inspection and every car is sold by sample, exposed on the floor of the Minneapolis Chamber of Commerce. After state inspection, sampling and sale of each car, disposition by written order is made, sending it to elevator, mill or connecting line. Disposition is made up to 4 p. m. of each day and is filed with the Chairman of the Association. As this consumes on an average 20 hours, only about a day and a half remains for switching, transferring and unloading.

It will be noticed, in the accompanying table, that the average time for unloading grain is 2½ days. Other subject commodities, 0.95 of a day; non-subject commodities, 3.20 days. This is for the three busiest months of the year, and as compared with the entire year 1890, shows a decrease in time for both subject and non-subject of more than half a day.

Freight Car Detentions at Minneapolis and St. Paul.

	Oct. '91.	Nov. '91.	Dec. '91.
Cars subject to rules.....	45,116	36,206	40,018
Average detention, days.....	0.94	0.98	0.93
Cars exempt.....	1,389	1,392	1,761
Average detention, days.....	3.11	3.12	3.37
Cars, grain.....	15,087	14,551	15,230
Average detention, days.....	2.50	2.50	2.50

* Not included in first item.

The estimated time, prior to this organization, is seven

days. No reliable records as to this, however, are obtainable, although this is considered a very conservative estimate.

For the 12 months of 1890 the grand total of cars handled was 491,886; those subject to the rules were detained 151 days, and those exempt 3.80 days on an average. In October, 1890, a record was kept of the non-subject cars in each of the two cities, as follows:

St. Paul, 126 cars; 848 days total detention; average, 6.7 days.
Minneapolis, 171 " 2,379 " " " 13.9 "

Both shippers and receivers favor the present plan, thereby indorsing the work of these associations. The former favor it because they receive prompt pay for their grain, and the latter because they are enabled to do a much larger business than formerly without increase in capital invested. It can be easily seen how this is possible when it is known that before these associations were formed the yards in Minneapolis

cars. This system of patrol has been found to be preferable to the plan of having reports furnished by agents of the companies.

There is no chance for much loss of time after the destination of a car has been given, as a road must make prompt transfers to other roads of both loaded and empty cars.

On April 23, 1891, a transfer time table was put into effect as an experiment, and it has proved so effective that the original card is still in use. Despite the limited and awkward terminal facilities in Minneapolis and the immense volume of traffic interchanged, the system has been an unqualified success. The December, 1891, report shows a total of 74,415 cars handled during that month without delay or friction between the roads. There were 2,688 transfers made, only 122 of which, less than 5 per cent., were behind time. This is remarkable when it is remembered that the plan is a comparatively new one, and that the transfers are made by the yard

crews and through busy and crowded yards. Prior to the formation of the Terminal Dispatch, transfer tracks were continually blocked, and it was frequently impossible for weeks to move cars on certain of the tracks. Then, too, when cars were delivered to connecting lines without previous notice or arrangement the receiving line would refuse to receive cars for certain industries, saying they (the industries) had already too many cars on track. This added to the confusion and aggravated the delays, so much so that when the industry had caught up with its unloading, the cars were frequently so blocked in that two or three days would elapse before more could be delivered. Under the present system there has been no delay to cars, nor have there been any blockades in the yards.

The managements of the roads are heartily in accord with the Association, and co-operate faithfully in all its work. They recognize the fact that it is indispensable in securing prompt loading, unloading, disposition and switching of cars enabling them to obtain the maximum use of their rolling stock and at the same time minimizing repairs as well as yard expenses, by preventing the repeated and unnecessary handling of cars. In short, by centralizing the authority in matters pertaining to car service and car movement in the Association it is the unanimous opinion that greater benefits

Safe Loads, in Pounds, for Yellow Pine Struts.

Computed from the Formula $1000 - 0.0001L^2$, L = Length in inches
 d = smaller diameter in inches. This is approximately the same with a factor of safety of 4½, as the formula $4250 - 43.3 \frac{L^2}{d^4}$, which was obtained by plotting all experiments obtainable, on full-sized sticks, made with the Government Testing Machine at Watertown Arsenal and represents the average of all the lowest breaking weights in each set of tests.

J. H. Stanwood, Mass. Institute of Technology, 1891.

Size	6 Ft.	8 Ft.	10 Ft.	12 Ft.	14 Ft.	16 Ft.	18 Ft.	20 Ft.
4x4	13,100	12,200	11,200					
4x6	19,700	18,200	16,800					
4x8	26,200	24,200	22,400					
4x10	32,800	30,400	28,000					
4x12	39,400	36,500	33,600					
6x6	31,800	30,200	28,800	27,400	25,900	24,500		
6x8	42,300	40,300	38,400	36,500	34,600	32,600		
6x10	52,800	50,400	48,000	45,600	43,200	40,800		
6x12	63,400	60,500	57,600	54,700	51,800	49,000		
8x8	74,000	70,600	67,200	63,800	60,500	57,100		
8x10	84,500	80,600	76,800	73,000	69,100	65,300		
8x12	95,200	90,300	85,400	81,500	77,600	73,700	46,700	44,800
8x14	106,000	100,600	95,200	90,800	86,400	82,000	58,400	56,000
8x16	116,800	110,900	105,000	100,600	96,200	91,800	70,100	67,200
8x18	127,600	121,200	115,800	111,400	107,000	102,600	81,800	78,400
8x20	138,400	131,500	126,100	121,700	117,300	112,900	93,400	89,600
10x10	149,200	142,300	136,900	132,500	128,100	123,700	104,900	101,000
10x12	160,000	152,600	147,200	142,800	138,400	134,000	115,200	111,300
10x14	170,800	162,900	157,500	153,100	148,700	144,300	125,500	121,600
10x16	181,600	173,200	167,800	163,400	159,000	154,600	136,700	132,800
10x18	192,400	183,500	178,100	173,700	169,300	164,900	147,800	143,900
10x20	203,200	193,800	188,400	184,000	179,600	175,200	158,900	155,000
12x12	214,000	204,600	199,200	194,800	190,400	186,000	169,700	165,800
12x14	224,800	214,900	209,500	205,100	200,700	196,300	180,000	176,100
12x16	235,600	225,200	219,800	215,400	211,000	206,600	190,300	186,400
12x18	246,400	235,500	230,100	225,700	221,300	216,900	200,600	196,700
12x20	257,200	246,300	240,900	236,500	232,100	227,700	211,400	207,500
14x14	268,000	256,600	251,200	246,800	242,400	238,000	221,700	217,800
14x16	278,800	266,900	261,500	257,100	252,700	248,300	232,000	228,100
14x18	289,600	277,200	271,800	267,400	263,000	258,600	242,300	238,400
14x20	300,400	287,500	282,100	277,700	273,300	268,900	252,600	248,700
16x16	311,200	298,300	292,900	288,500	284,100	279,700	263,400	259,500
16x18	322,000	308,600	303,200	298,800	294,400	290,000	273,700	269,800
16x20	332,800	319,400	314,000	309,600	305,200	300,800	284,500	280,600
18x18	343,600	330,200	324,800	320,400	316,000	311,600	295,300	291,400
18x20	354,400	340,500	335,100	330,700	326,300	321,900	305,600	301,700
20x20	365,200	350,800	345,400	341,000	336,600	332,200	315,900	312,000

and Duluth, the principal grain markets, invariably were blocked during the fall season, and it was no uncommon occurrence for cars to stand on track loaded as many weeks as they do days now. There were cases where cars loaded with wheat did not move for six weeks. The yards and side tracks were so blocked that it was impossible to switch out cars when they were wanted. During the past three years there has been no blockade or anything like it at Minneapolis, St. Paul, or Minnesota Transfer. This Association is really a dispatch association. The office of the Chairman is connected by telegraph with the offices of all the yardmasters of the different roads. By means of the wire, delayed and diverted cars are traced and hurried to their destination. Consignees file all complaints of delays with the Chairman and these are at once investigated, rectified and further delays prevented by persistent demands upon the road at fault and the close following of the progress of each car to be placed for unloading.

In order to prevent a surplus of cars for mills, elevators or other industries, the number of cars is restricted to two days' supply, by allowing one day's supply on hand and an equal amount in transit. In order to obtain this result it is necessary to have a daily report of cars on track and a summing up at a certain hour each day. Should the total exceed the limit, notice is served upon the trade that orders for delivering cars to these particular industries will not be received and that other disposition must be given, thus precluding the possibility of blockades from this cause. Heretofore mills and other industries carried excessive supplies on track, and demanded, day after day, that special cars be switched out of the mass to suit their convenience and manufacturing requirements, causing great expense to the railroad companies. Every day the employees of the Association patrol the public delivery tracks and private industry tracks, as well as the yards of all lines, taking a record of all cars subject to the rules, also of all empty freight

are secured to both the shipper and the carrier. Mr. Robert Dudgeon is the chairman of the Minneapolis-St. Paul Association and Mr. James Kelley occupies similar position with the Lake Superior Association.

We append the views of a few large grain dealers:

W. F. Commons, of Commons, Bassett & Co., states that his firm has had as many as 600 cars on track in former years, whereas under the present rules they rarely exceed two days' receipts, 50 cars. They are highly pleased with the change.

C. W. Harrington, of Van Dusen, Harrington & Co., testifies to the benefits derived by stating that their "Star" elevator has had better car service than at any other period of its existence. A recent comparison developed the fact that there were only required at that house, to complete shipments delayed for cars, 7 cars as compared with a shortage of nearly 300 cars in previous years.

Mr. Martin, of Martin & Wyman, says that owing to the prompt movement unloading they now make returns to shippers in three or four days, instead of weeks as formerly. They are enabled to double their business on the same capital.

Mr. Soule, President of the T. L. Soule Elevator Co., and a member of the commission firm of O. P. Coster & Co., emphatically states that the benefits derived from the Terminal Dispatch Association are incalculable. He also says that a suspension of its rules would paralyze business entirely.

Proposed New Formula for Yellow Pine Posts.*

Believing that the formula of C. Shaler Smith given in Trautwine gives too large values for yellow pine posts, and having the usual objection to the "step" formula, the writer, for his own information and use, has taken the trouble to plot the values of all the tests on full-size sticks made at the Watertown Arsenal and printed in the Government reports.

From the drawing herewith the straight line formula

$$S = 5,000 - 43\frac{1}{2} \frac{L}{d}$$

* Copyright 1892 by James H. Stanwood.

was easily deduced, which represents the average of all the tests.

For the average of the lowest values in each set of tests the formula

$$S = 4,250 - 43\frac{1}{2} \frac{l}{d}$$

was found. The line representing this formula chanced to be parallel to the first one. With this latter equation as a basis the working formula

$$S = 1,000 - 10 \frac{l}{d}$$

gives a factor of safety of 4.25 approximately. This very simple equation is easily memorized and by its use the safe

Uniform Standard Time.

What follows is the chief part of the report of the Special Committee on Uniform Standard Time, submitted at the recent Annual Meeting of the American Society of Civil Engineers.

The movement for placing the reckoning of time on a scientific basis was first considered by the American Society of Civil Engineers in 1881, when this Committee was appointed to carry out the wishes of the Society with respect thereto. . . . The subject of uniform standard time for railroad, telegraph and civil purposes generally was submitted for consideration on June 15,

uary, 1883, that Congress had passed a joint resolution authorizing the President to call an International Conference to fix on a prime meridian to be used in common throughout the world for reckoning time and longitude.

At the annual meeting in January, 1884, the Committee reported that the railroad authorities had met at Chicago in the previous October and agreed to adopt the system of standard time recommended by the Committee, and that the new system had actually gone into effect throughout the country generally.

In June, 1884, the Committee made certain recommendations respecting another reform in time-reckoning, the notation of the 24 hours in a simple series, abandoning the expressions *ante* and *post meridian*.

At the annual meeting in January, 1885, the Committee reported that an International Conference had been held at Washington in the previous October; that 26 nations had been represented by delegates and that they had with unanimity agreed on the meridian of Greenwich as the prime meridian for the world, and had passed resolutions in harmony with and confirming the principles of time reckoning favored by the Society.

At the summer convention, held at Denver, in July, 1886, it was announced that the Canadian Pacific Railway had been opened, and that the 24-hour notation had been adopted in operating the line from Lake Superior to the Pacific Coast. The Committee likewise reported that the new notation had been adopted on the telegraph lines extending from England to Egypt, South Africa, India, China, Japan, Australia and New Zealand.

At the annual meeting in January, 1888, the Committee reported that the 24-hour notation had been adopted on the Intercolonial Railway, extending from Quebec to Halifax, and that the managers of that line had placed at the service of the Committee a number of letters respecting the new system, establishing beyond all question that wherever the 24-hour notation had been tried it had proved to be advantageous to railroad service and the public. The Committee was likewise in a position to announce that standard time had been adopted throughout the Japanese Empire on Jan. 1, 1888.

At the annual meeting in January, 1889, the Committee submitted two important letters from the managers of the Canadian Pacific & Intercolonial Railway, setting forth that the new notation had been thoroughly tested for two or three years on 3,657 miles of railroad, that it had been introduced with care, that the public readily accepted the change, that no objections to it had been heard in any quarter, that its extreme simplicity facilitated the movement of trains, and that the impossibility of errors promoted the safety of the public.

The Committee reported at the annual meeting in January, 1890, that up to date between 500 and 600 prominent men had been heard from respecting the 24-hour notation, and of these an exceedingly small percentage were adverse to its early adoption. Among those in favor of its adoption were 123 presidents, vice-presidents and managers, 193 superintendents and traffic managers of railroads. The Committee likewise reported that the time reform movement was attracting much attention in Europe.

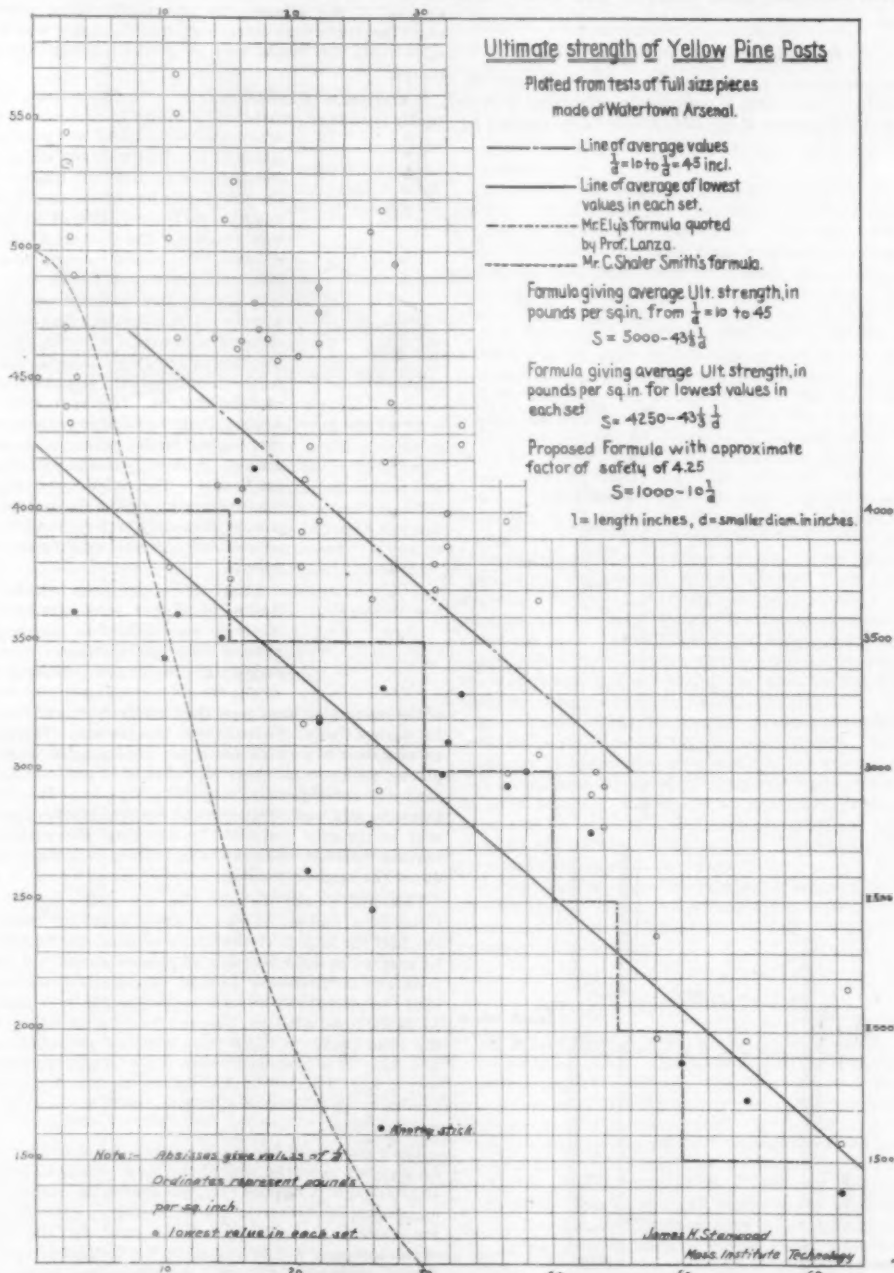
At the annual meeting in January, 1891, the Committee reported that railroad men continued to be heard from, and that up to date a total number of 403 presidents, managers and others in the highest official positions had communicated directly with the Society, expressing themselves in favor of the adoption of the 24-hour notation. As the aggregate length of railroad with which these officers are connected is about 140,000 miles, it appeared obvious that the proposal to adopt the 24-hour notation meets with general assent, that there is no insuperable obstacle in the way of its introduction throughout North America, and that the change may be effected at any time by joint arrangement among railroad men.

The committee reported the adoption of the 24-hour notation throughout the Indian Empire and on the short railroad mileage in China. Within the year the mileage of railroad on which the new notation had been permanently introduced had increased from less than 4,000 miles to over 20,000.

1892.

The Committee has now to report that during the past year the advance of the movement has been most marked in Europe. For a number of years back the question has been under discussion. The most remarkable speech recorded is that of the late Count von Moltke, in the Imperial German Parliament, at the sitting of March 16. This, perhaps the last public utterance of the illustrious and venerable statesman-soldier, from the influence it has had in Europe, and will continue to have throughout the world in extending the advantages of a movement in which this Society has taken a leading part, must be of interest to every member. A translation, somewhat abbreviated, is appended. [We do not print Von Moltke's speech. It urges standard time for military and civil reasons.—EDITOR.]

By the latest information from Europe it appears that the Belgian Minister of Railroads, Posts and Telegraphs has issued a notice to all the services connected with his department announcing that from May 1, 1892, standard time will be used. He invited all the railroad companies to adopt the same reckoning, and asks his colleagues in the government to issue directions for all services to



load for a yellow pine post may almost instantly be worked out "in the head." For the sake of comparison the formulas of C. Shaler Smith and Mr. Ely have been plotted.

For those who prefer not to depart from the strict column formula of the form

$$S = \frac{K}{1 + \frac{l^2}{a d^2}}$$

the following:

$$S = \frac{4000}{1 + \frac{l^2}{2,500 d^2}}$$

may be used, which, if plotted, will be found to represent the average of the lowest values.

In each of the above formulas

l = length in inches.

d = smaller diam. in inches.

From the expression

$$S = 1,000 - 10 \frac{l}{d}$$

the table of safe loads has been computed.

Trusting that this will be of use to others it is respectfully submitted to the profession.

Since making this drawing the recent experiments of Kirkaldy on wood columns of fairly large size have been applied to the proposed formula and found to agree quite well with it.

JAMES H. STANWOOD, S. B.,
Instructor in Civil Engineering,
Mass. Institute of Technology.

JAN. 15, 1892.

1881, at the summer convention of the Society held in Montreal, when the following special Committee was appointed: Sanford Fleming, of Ottawa, Chairman; Charles Paine, of New York; Theodore N. Ely, of Altoona, Pa.; J. M. Toucey, of New York; Prof. I. E. Hilgard, of Washington; Prof. T. Egleston, of New York; Gen. T. G. Ellis, of Hartford, Conn. It is with deep regret that the committee lost two of its members: General Ellis, who died in 1883, and Professor Hilgard, who resigned owing to impaired health in 1888. Mr. Fred. Brooks, of Boston, was added to the Committee in January, 1889. With these exceptions no change has been made in the personnel of the Committee since it was appointed in the first instance nearly 11 years ago.

In 1882 a pamphlet of 34 pages was issued and widely circulated throughout the United States, Canada and Mexico. With the pamphlet, which fully explained the nature of the investigation, a series of questions were issued to which replies were invited. In May, 1882, the committee reported at the summer convention of the society held at Washington and presented a synopsis of the replies to questions received up to that date. The Society adopted the recommendation of the Committee that steps be taken to obtain the establishment of a zero meridian which would be common to all nations for reckoning time and longitude, and that the Congress of the United States be petitioned to take such action as may be necessary to attain the end sought.

The Committee reported at the annual meeting in Jan-

conform to the new reckoning in their relations with the public. The government of Holland has likewise taken decisive action and authorized the adoption of standard time, based, as in Belgium, on the zone of the Greenwich meridian. This decision will come into force on May 1, 1902, for the interior service in Dutch territory. From April 1 next standard time based on the reckonings of the meridian 15 deg. east will be introduced in the states of Bavaria, Wurtemberg, Baden, Alsace and Lorraine. Since Oct. 1, 1891, Austria-Hungary has by official authority adopted standard time in all its public services. In Prussia there has been discussion and much difficulty owing to a reactionary movement, but a change followed the views expressed in the Reichstag by the late Field Marshal Von Moltke. And now it is by Imperial direction that the adoption of standard time is proposed. It is not unlikely, therefore, that the proposition will be finally resolved upon at the next meeting of the chamber.

It is evident that Europe is now making the first great steps in time reform, which America made in 1883, in introducing standard time into general use. In the second important step, the adoption of the 24-hour notation, this country is somewhat anticipated by India, and we need not be greatly astonished to hear of a rapid development of the reform in Europe once the first step is taken. Already in the Belgian parliament a prominent member has moved the government to introduce the 24-hour notation.

It cannot but be a matter of congratulation to the American Society of Civil Engineers that these important movements for placing time reckoning on a proper scientific basis, make progress in so many quarters. This Society has been one of the first and most active movers. It is recognized to have greatly stimulated the movement, not in this country alone, but throughout the globe, and it must eventually receive the fullest credit for the action which it has taken from the beginning.

[The following preamble and resolution were adopted by the Society in the Annual Meeting.]

Whereas the several reports of the Special Committee on Uniform Standard Time establish that the movement for reforming the time system of the world has made substantial progress in the three continents of America, Asia and Europe; and

Whereas the railroad companies of America were the first to recognize the value of the reform and bring into practice the hour zone system; and

Whereas it appears that a large majority of prominent railroad men are in favor of the early adoption of the 24-hour notation; and

Whereas it would be advisable to bring the new notation into use in railroad administration throughout the country within the present year; and

Whereas, the shores of the New World were first sighted by Columbus on October 12, 1492; and

Whereas, the 24-hour notation is essentially Italian in its historical origin and it would be a graceful compliment to the land which gave birth to the illustrious discoverer to adopt the new notation on the four hundredth anniversary of the day upon which he first saw land appertaining to the Western Continent;

Be it thereupon Resolved, that such steps be taken, as the Committee on Standard Time may deem necessary, to invite all the railroad companies of the United States, Canada and Mexico, to adopt the 24-hour notation on the twelfth day of October next.

Mozier's Three-Position Semaphore.

The accompanying drawing shows the construction of a semaphore recently devised by Mr. A. M. Mozier, Superintendent of the Chicago & Erie, which is in use as a block signal on the New York, Pennsylvania & Ohio, which road Mr. Mozier was connected with until a few months ago. The illustration also shows the connection to the telegraph office, together with an outline of the safety levers by which the operator controls the blade. This safety lever is also the invention of Mr. Mozier, and was described in the *Railroad Gazette*, of Jan. 3, 1890. In brief, it is an electrical cut-out, connected with the lever for pulling the signal, and so arranged that whenever the lever is at any other position than "danger" (to stop trains) the operator is unable to work his Morse key, and thus is unable to acknowledge a train order.

The semaphore is used under the rules which were lately adopted on the New York, Pennsylvania & Ohio, and which were printed in the *Railroad Gazette* of Oct. 7 last, and its special feature is the arrangement for throwing the arm up to an angle of 45 degrees for the caution position.

The counterweight has a slot, between which two roller bearings are fixed, so that its movement must always be vertical. It is attached to the blade by two chains of equal length, one fastened on each side and about 8 inches from the pivot. The blade is itself weighted so as to drop from the caution position to the horizontal position by gravity, while the counterweight prevents further descent. The Erie signals are ordinarily erected with hollow posts, within which the signal lamp is raised by means of a chain running over a pulley into the office. The signal lever inside the office is so adjusted that its movements are the same as those of the signal blade: pulling the handle down places the signal at all clear, and pushing it up places it in the caution position. The key circuits are cut out while the signal is either at all clear or caution.

Twenty-five of these signals have been in use for six months, and 110 more have been ordered, the extension of the block system throughout the lines of the New

York, Pennsylvania & Ohio having been decided upon several months ago. The Chicago & Erie will also soon be blocked.

Officers of the Erie not only express great satisfaction with their block system, but think that they have already seen an incidental benefit in the greater care with which engineers handle their trains. The necessity of keeping a sharp and incessant lookout for caboose lights when running at night being very materially relaxed by the use of the block system, it is believed that they keep better watch of their own trains and detect hot boxes, fallen brake beams, parted couplings and other dangerous circumstances more promptly and surely than before.

Railroad Projects in Costa Rica.

The outlook for a transisthmian railroad across the Republic of Costa Rica is sufficiently promising to warrant a consideration of the advantages to be secured by

the large cities in the central plateau sell as high as \$500, and even \$800, an acre.

Formerly the only port of Costa Rica was Punta Arenas, on the Pacific Coast, but a few years ago a railway was opened from Limon, on the Caribbean Sea, to San José, the capital, and an additional duty of 5 per cent. was imposed upon all goods passing through Punta Arenas, with the purpose of increasing the importance of the port on the Atlantic side. In spite of this the exportations last year from Punta Arenas were larger than from Limon, the reason being that excellent wagon roads to the Pacific enable the teamsters to successfully compete with rail carriage, in addition to which the dryness of the climate on the mountainous western coast prevents that deterioration of the coffee which results from the humid airs of the low-lying Atlantic plains.

It may seem strange that in a region where a large traffic is already carried on by means of cart roads, and where the total lineal distance from coast to coast is only 103 miles, the construction of railroads has been so long delayed; but the reason is obvious from an examination of Mr. Merivale's report. The Central American range of the Andes courses through Costa Rica, rising between the central plateau and the Pacific Ocean to a height of over 3,900 ft. The western slope of this range is broken into a number of irregular valleys, and is furthermore gullied by an infinitude of deep ravines. The cart road has avoided these by climbing at once into the higher lands, where a railroad cannot follow without excessive gradients. The whole country is also overgrown with a dense tropical jungle, through which railroad reconnaissance is a matter of extreme difficulty.

After trying to keep within the limits of 3 per cent. grades Mr. Merivale was obliged to secure permission from the Government to use steeper grades, or else condemn the route, which, according to the terms of the concession must pass through the towns of Escazú, La Garita, Grecia, Naranjo and San Ramon. The plans as now drawn provide for 8 per cent. grades in many places, with several short stretches of 12 per cent. The road will consequently be operated by a combination of adhesion and rack systems, and the cost of construction will be greatly reduced by avoiding the numerous ravines which would have to be bridged on a route lower down the mountain sides.

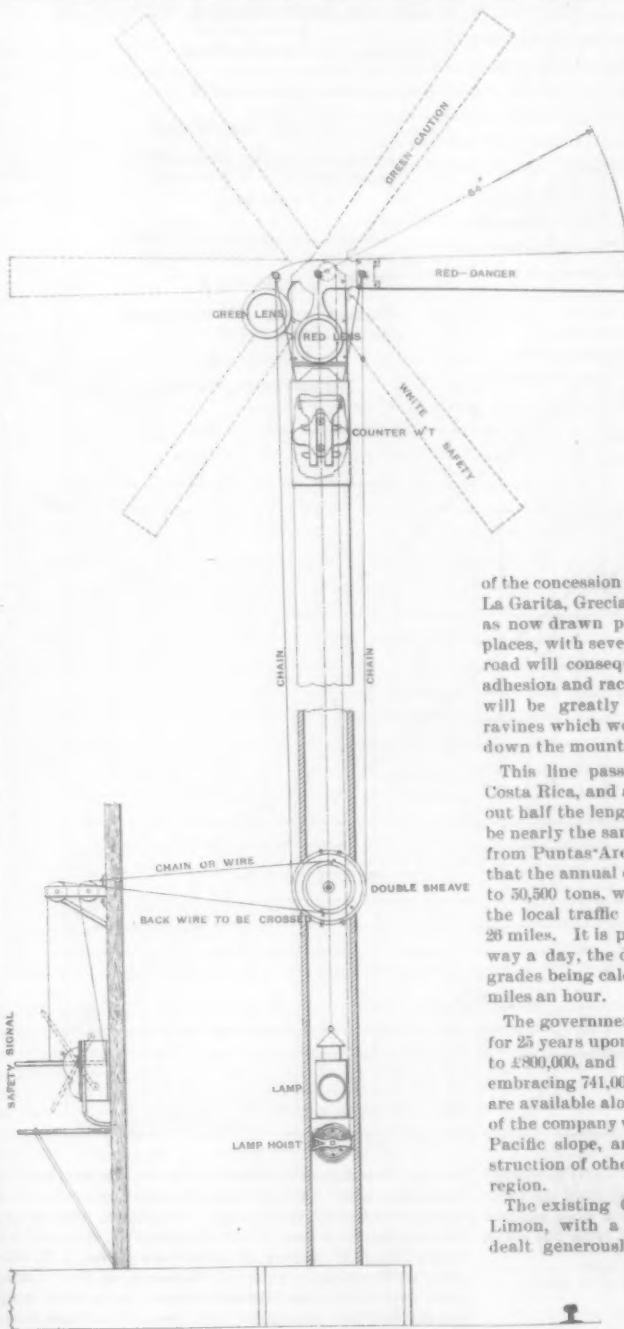
This line passes through the best coffee country in Costa Rica, and as this lies in a belt reaching throughout half the length of the proposed road, the traffic will be nearly the same whether shipments abroad are made from Puntas Arenas or Limon. Mr. Merivale estimates that the annual export and import traffic will amount to 50,500 tons, with an average haul of 56 miles, and the local traffic to 25,000 tons, with an average haul of 26 miles. It is proposed to run three freight trains each way a day, the duty of the engines on the 8 per cent. grades being calculated at 60 tons, with a speed of 6.2 miles an hour.

The government has given a guarantee of five per cent. for 25 years upon the cost of the road, which is limited to £800,000, and besides this, has granted a tract of land embracing 741,000 acres. Unfortunately, no public lands are available along the line of the road, but the grants of the company will be located on the fertile and healthy Pacific slope, and this will doubtless lead to the construction of other roads to develop the resources of the region.

The existing Costa Rica Railway, from San José to Limon, with a branch to Alajuela, has always been dealt generously with by the government, and Mr. Minor C. Keith, who secured the concession and built this road, has now petitioned for a subvention of £100,000 to build another line northward from the capital, through the rich San Carlos district to the Nicaragua

Canal. It would seem that the government was favorably disposed toward this project, and it is also reported that it will loan the Costa Rica Railway Co. an additional £100,000 to carry out further improvements on its present line. The San Carlos project will be of great benefit to Costa Rica, and it likely that rates on this route will be very low since the construction of the proposed Ochoa dam will afford competency slack water navigation on the Rio San Carlos for a distance of over 40 miles southward.

With the development of the San Carlos region and of the Pacific slope by means of railroads, together with the advantages of a continuous route from ocean to ocean, Costa Rica will make rapid commercial advancement. Her credit has always been maintained at a high standard, and her revenue invariably exceeds her expenditures. It is also noticeable that she keeps aloof from the broils which so often desolate Central America, and many Americans and Englishmen have already acquired



Mozier's Three-Position Semaphore.

such a route. The idea is a very old one. Indeed it has been discussed so long, and efforts to carry it out have so often failed, that the Costa Ricans had begun to despair of ever realizing their hopes. Within the past year, however, a careful survey has been made by Mr. Walter Merivale, A. M. I. C. E., in the interest of the Costa Rica Pacific Railway Co., and work will probably soon be begun upon the line which he has located.

The Republic of Costa Rica comprises no more than 24,000 square miles, an area equal to about half that of the state of New York. In 1883, the population was estimated at 223,000, of which, almost, the total was collected in the elevated lands midway between the Atlantic and the Pacific. This is an extremely rich section of country, producing an excellent coffee, which constitutes the most important product of the republic, and is also well adapted to the culture of cacao. The shipments of coffee in 1890 amounted to more than ten thousand tons, and good coffee lands in the vicinity of

coffee estates and have settled permanently in the country.

A Portable Drilling Machine.

We illustrate herewith a new drilling machine specially designed by George Burnham & Co., of Worcester, Mass., for railroad, bridge and general structural purposes. It is

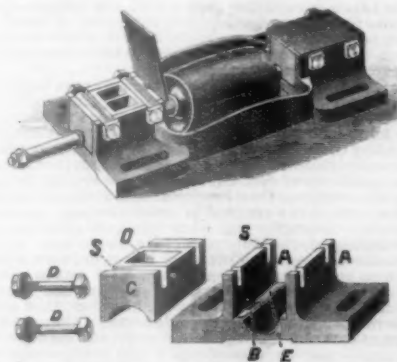


intended to take the place of the ordinary hand ratchet drill. It is provided with an automatic feed having four variations. It is also double geared to provide for varying power and speed. The spindle has a movement of four inches, with hand wheel for operating the return of drill. The machine is provided with a tool grinding attachment whereby the drills may be at all times kept to a good working condition without traveling to the grindstone. The illustration shows the machine fitted with a clamp for holding a rail for drilling. This clamp can readily be removed and the machine made ready for other styles of work. It can be set up on a work bench and made use of as a bench drill. Wheels 6 in. in diameter and 2½ in. face are provided as shown to make the machine portable. It weighs some 200 pounds.

The White Journal Box.

The cuts herewith show a recent improvement in journal boxes, designed to facilitate proper adjustment and providing for a more perfect and continuous lubrication than is practical in journal boxes as ordinarily made. The Franklin Institute of Philadelphia has recently awarded the Longstreth silver medal of merit for this invention.

Briefly, the improvements consist in making the walls *AA* of the casting to extend up to the height of the top of the cap box *C*. These walls being planed through longitudinally the cap is fitted between them. To secure the upper or cap box, instead of using bolts or screws to draw it down in the direction of the shaft, it is clamped in position by bolts *DD*, laid in grooves *S*, cut transversely to the axis of the shaft across the top of the cap and through the side walls. By tightening these bolts the walls are drawn together, clamping the cap box firmly between them. A large oil chamber *D* is provided in the upper cap. The packing of paper or wood usually found in the ordinary journal box is entirely dispensed with here, thus leaving room for a strip of wicking *E*, one edge of which comes in contact with the shaft for lubrication and the other edge connects with an oil well *B*. Channels are provided in the casting for carrying any excess of oil back to the well. It is claimed that this journal box can be adjusted to the



shaft with accuracy in one-tenth of the time required to properly adjust a journal box of the usual type. This is accomplished by thoroughly oiling the shaft where it enters the box, and placing the cap in position where it seats itself upon the oil in accurate adjustment; then by tightening the bolts immediately the cap will be rigidly secured in its proper place. Strain on the bolts cannot affect the adjustment of the cap, which is evenly separated from the shaft by the film of oil. Experience has shown that the clamping of a journal box in this way is effective and durable.

This patent is controlled by the Pennsylvania Machine Co., Limited, Philadelphia, Pa., of which the inventor, Mr. J. J. White, is President.

Berlin's Proposed Underground Electric Railroad System.

The attention now given to underground electric railroad systems lends special interest to a report on the proposed system for Germany's capital by the Allgemeine Elektrizitäts-Gesellschaft, of Berlin. The city is to be traversed underground by two lines, crossing each other at right angles and following the main lines of traffic. The quadrants thus formed are to be put in communication with one another by two concentric underground belt lines, and the four lines together, it is thought, will afford ready communication between all parts of the city. Stations are to be placed at all crossings and at a number of other desirable points. Separate tunnels are to be driven for the different lines of track, and the several sections are to be entirely independent of one another, crossings being effected at different grades. There are to be no switches; loops are to be provided at the terminals, so that the system will be practically endless. All danger of collision, it is thought, will thus be avoided.

The tunnels are to be of mild steel tubes, of oval cross-section, with walls about ¼ in. thick, and the two axes measuring about 11½ and 9.8 ft. They are to be at depths below the surface of from 20 to 50 ft., so that the bed of the river Spree will be crossed at a depth of at least 7½ ft. The tunnel tubes will be built up of flanged plates, bolted together. The spaces outside the tubes or tunnel linings will be filled with cement mortar, and a coating of the latter will be applied also to the inside. Nothing is said of the system of tunneling to be employed, though it may be inferred that shields will be used in the manner which has now become familiar.

The electric propulsion system to be used will, in the main, be that installed by the Allgemeine Elektrizitäts-Gesellschaft at Halle, Germany. The cars are to be run not singly, but in trains of three. The cars are to have two pairs of axles each, and are to be built with centre aisles, and seating capacities for 40 passengers. Independent electric locomotives are to be used for the trains, the current being supplied from central stations. The trains are to be run at intervals of three minutes, and at speed of about 25 kilometers (about 15½ miles) per hour. At this speed, it is thought, the trains themselves will accomplish all that will be necessary in the way of ventilation, though the possible use of electrically-driven ventilating fans is mentioned.

The stations will be between the parallel tunnels, and will also be constructed on the tube system. Several tubes will be laid side by side, and the intervening walls will be replaced by massive columns. Elevators are to be used to carry passengers to and from the stations from the street surface, and each elevator is to have a capacity of from 40 to 50 passengers. Besides the elevators, however, there are to be stairways.

It is of interest, in connection with this, to note that the city of Vienna also is contemplating building an underground system on the same lines, essentially, as those mapped out for Berlin.

Narrow Gauge Railroads in Europe.

Mr. Alfred Birk reviews, in the *Journal* of the German Railroad Union, the present position in Europe of narrow gauge railroads, on the adoption of which depends (he says) any further considerable extension of railroads in civilized countries. In Germany, he says, the narrow gauge has received very different treatment in the different countries. Saxony was early in the field with 75 centimetre (29½ in.) lines, and has continued to build them; Prussia has only begun to pay attention to the narrow gauge; Bavaria will have nothing to do with it; in the smaller German states it has fared better, especially in Hesse. At the close of 1890 the whole German Empire had 542 miles of narrow gauge railroad, with 618 miles of track and 352 stations—on the average little more than a mile and a half apart.

In Austria, though it early built the narrow gauge military line in Bosnia, the narrow gauge gained ground slowly, but it receives more attention now, especially in Styria, where a local line will soon be opened. Austria (not including Hungary and Bosnia) has about 60 miles of narrow gauge railroad.

In Belgium a corporation called the National Local Railroad Co., which builds many short lines, constructs metre gauge lines chiefly, and 3 ft. 6 in. lines where they connect with Dutch local roads of that gauge. There are 584 miles of narrow gauge railroad in Belgium.

Holland has had steam tramways for many years, and at the beginning of 1890, 304 miles of these were of narrow gauge—29½ in., 3 ft. 3½ in. and 3 ft. 6 in.—and not quite so much of standard gauge. One of the cheapest of these lines, of 29½ in. gauge, cost \$10,044 per mile, equipped.

France of late years has built a great many narrow gauge lines; in 1890 the Government issued regulations for the construction of lines of 1 metre and of 75 centimetres gauge, but nearly all lines built are of the former. The Decauville lines of 60 centimetres gauge at the last Paris Exhibition attracted great attention, and there is talk of employing it for local lines. At the end of 1899 France had 1,848 miles of the local lines termed "secondary railroad," and of these 843 miles were narrow gauge lines.

In Switzerland nearly all the mountain railroads built of late years have narrow gauge. In Italy, Portugal and Spain, Mr. Birk says that the narrow gauge has not made much progress; but there are at least three narrow gauge steam tramways in Italy. In England the Festiniog Railway has had no imitators, and in Ireland, where 93 miles of narrow gauge road were built, any further extension of them is opposed.

Norway has built little else than narrow gauge railroads since 1862, and has now about 620 miles of them, against 372 of standard gauge; and about 930 of the 4,600 miles of railroad in Sweden are narrow; the gauges vary from 31½ in. to 47½ in. Some of these, especially the early ones, have been very profitable, but others were built for speculation, and several do not pay. Denmark, which is a flat country, opened its first narrow gauge railroad last summer. It connects a fishing village with a fish market, and was built chiefly to carry fish; is very nearly straight and level, and cost \$8,526 per mile.

Greece, which until 1883 had but one railroad, the 6-mile, standard gauge road from Athens to its port, Piræus, has since then built a considerable system, all of metre gauge. At the close of 1899, 372 miles of this system were completed and 204 miles under construction. The most productive line yielded \$5,200 gross and \$3,046 net in 1898, but no other more than \$3,022 gross and \$1,100 net. A line from Athens north to connect with the European system through Turkey and Servia is being built with the standard gauge.

The Mason Air Train Signal.

The Mason Air Signal Co., of Chicago, has brought out a pneumatic train signal for freight or passenger service which has some new features. The system consists of a ½ in. pipe running the whole length of the train, coupled in the usual manner and with discharge, signal, and reducing valves, also a small reservoir from which the whistle is blown. The discharge valve is of a rotary type, and when opened admits air from the signal pipe to the small reservoir at its side. This reservoir is only large enough to produce the necessary reduction in pressure and holds the air until the handle of the valve is returned to its normal position, when communication to the signal pipe is shut off and the air in the reservoir is exhausted into the atmosphere. For a train of ordinary length a discharge valve with a reservoir of about one pint capacity is found to be large enough, but cabooses are fitted with a second one of about double the size for trains of 40 or 50 cars.

The signal valve is of the usual form, but has, in place of the usual diaphragm, a light piston which rises with a reduction of train pipe pressure, and opens a passage between the small reservoir and the pipe leading to the whistle, which blows until the pressure in signal pipe and reservoir is equalized. There is no variation in the length of the blast for a given train, except in case of a bad leak or breaking in two of the train.

The reducing valve is placed within reach of the engineer, and beside it is a gauge which shows the pressure in the signal pipe, which is kept at about 60 lbs. Ordinarily the air feeds slowly through the valve from the main reservoir as needed, but in case of a considerable reduction in pressure a single movement of the valve handle to an emergency position will quickly recharge signal pipe and reservoir. One large Western road has ordered this signal for one train, for trial.

Recent Progress in Car Construction and Design.*

Within the limits only a short review can be given the more recent progress in freight car construction; therefore, what follows is a collection of notes on the more important matters, much condensed.

The freight car in use twenty years ago was in appearance not unlike those we now use; but the difference in construction is considerable. The most important change has been in the increase of capacity. The old cars were adapted to carry 24,000 lbs., and weighed 20,000 lbs., or 0.87 lbs. of dead weight per pound of rated useful load. The present car weighs about 30,000 lbs., and has a capacity of 60,000 lbs., or 0.5 lb. of dead weight per pound of rated useful load. The car of twenty years ago had a capacity of 1,000 cu. ft., or about 20 lbs. of dead weight per cubic foot, or a rated capacity of 24 lbs. per cubic foot. The recent cars have a capacity of nearly 2,000 cu. ft., or 15 lbs. of dead weight per cubic foot and a rated capacity of about 30 lbs. per cubic foot. There has been 37 per cent. decrease in dead weight of box freight cars per ton of full rated load; 25 per cent. decrease in dead weight per cubic foot of capacity, and 25 per cent. increase in the full rated load per cubic foot of capacity.

The changes in the details are somewhat as follows: Fig. 1 shows the arrangement and size of sills formerly used, and fig. 2 that which is now acceptable. The comparative dimensions of sills are 4x7 in. and 5x9 in. The increase in the amount of material in the sills and the use of iron in the body bolsters has come from the increase in severity of service. Probably nothing illustrates this so well as an examination of the sills and drawbar attachments which have been taken out of light cars in the last five years. The wood removed is the best that the market affords; it is generally good seasoned oak with little or no decay. The repairs have consisted in replacing good material which is broken by good material which is not broken. . . . An ideal car would be one that breaks or needs repairs only as the material decays or is worn out except in the case of wrecks. Train wrecks are not the cause of the majority of repairs to underframes of freight cars. The severity of ordinary service is the main cause, and this will not be less in the future. Locomotives are being made heavier and trains longer and more cumbersome to

* Paper by Mr. D. L. Barnes, *Railroad Gazette*, before the Western Railway Club.



Fig. 3.

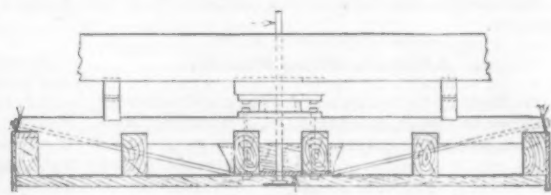
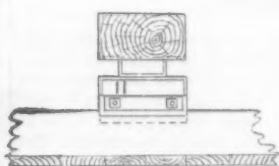


Fig. 1.

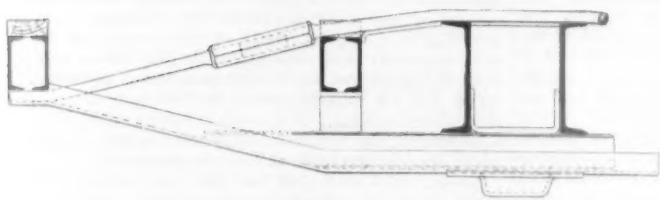


Fig. 4.

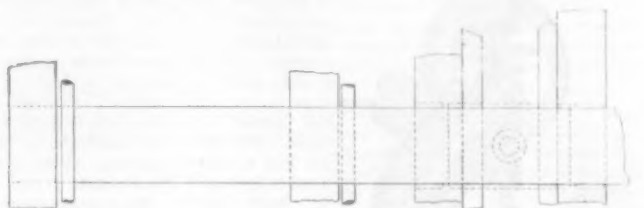


Fig. 2.

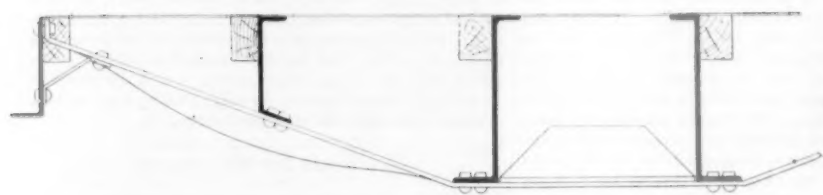


Fig. 6.

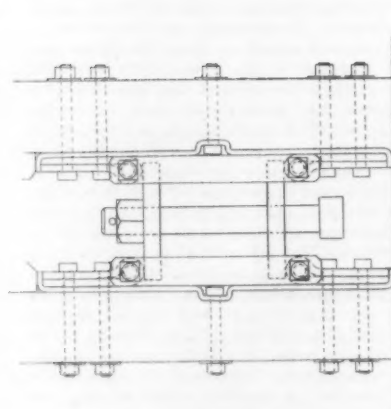


Fig. 8.

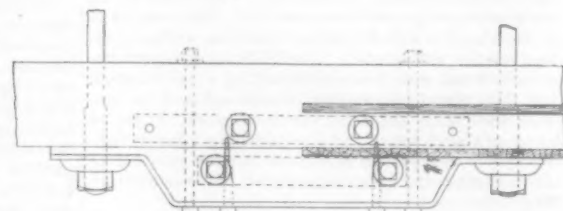
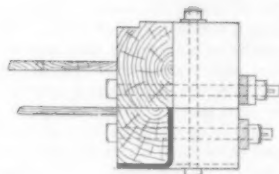
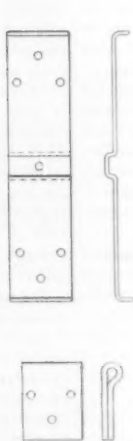
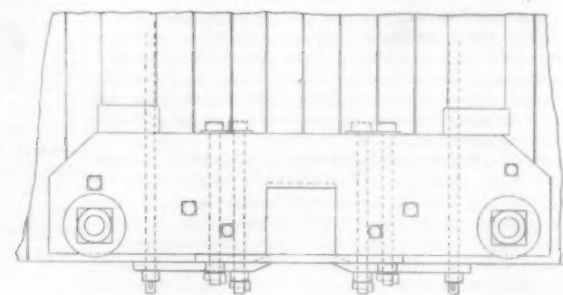


Fig. 10.



DETAILS OF FREIGHT CAR CONSTRUCTION.

WITH MR. BARNES' PAPER ON "RECENT PROGRESS IN CAR CONSTRUCTION AND DESIGN."

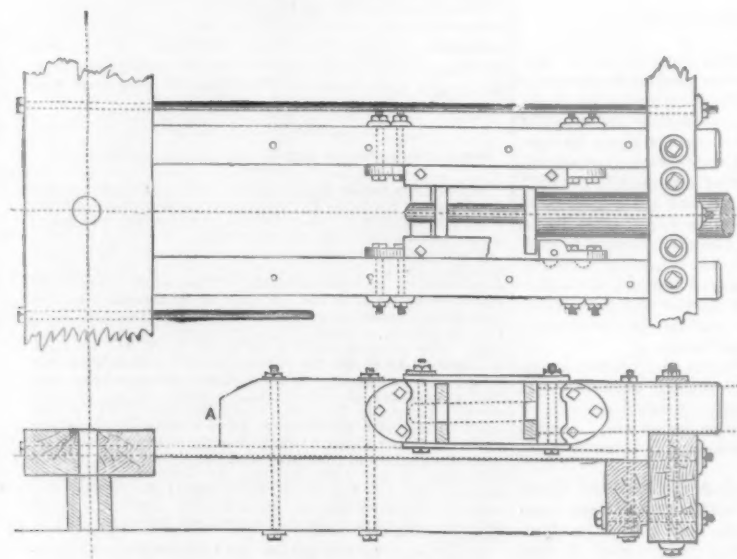


Fig. 7.

handle, and it is not to be expected that the engineers running locomotives will be more careful than they have been. On the contrary, the introduction of air brakes and automatic couplers will make engineers even more reckless. They will know that the trainmen are not between the cars at the time of coupling, and they will, perhaps, therefore be less careful about the speed at which couplings are made. The speed at which couplings are made is the one feature of service which most affects the life of car underframes.

Wooden underframes have been increased until the limit is reached. They are now as heavy as it is economical to make them. Formerly they were made about 4 x 7 in. They are now 5 x 9 in. The weight of wood has been so much increased that a steel under-frame having more than twice the strength of the best wooden frame can be made that will weigh only about one-half as much, and the saving in the total weight of the car is about 16 per cent., or 5,000 lbs. This means one average loaded car in every ten or twelve cars in a train;

hence the saving in cost of hauling the 5,000 lbs. per car is considerable. Metal underframes are now common in all parts of Europe. Fig. 3 shows the arrangement of sills almost universally used on German and French roads. In Mexico steel or iron sills are now generally used for both passenger and freight cars with a large reduction in the cost of repairs. . . . A few cars have been built in this country with an under-frame made of wood with iron plates on each side. The plan has no real value, as both the wood and metal are cut away with the large number of rivets necessary to hold the parts together. A composite car sill will not answer. The Harvey plan for steel underframes for freight cars is probably the best that has been used here. It consists of double channels for intermediate and side sills and a single large channel for center sills, as shown in fig. 4. . . . Several rolling mills are devoting their attention to the development of metal cars, hoping thus to find a large market for channels and rolled shapes. Four car companies and several railroads have made designs of metal cars and estimates of the cost of manufacture. The most interesting of them all is, I think, shown in fig. 5, prepared from drawings by Mr. R. P. Lamont. [The cut showing this has not been received. The description is held for another issue. —EDITOR.]

One fact that makes this subject an interesting one at the present time is the great reduction in the price charged for rolled steel beams for car construction. Formerly the price was 3½ cents per pound, or \$70 per ton. It is now less than 2 cents per pound, or less than \$40 per ton; so that now a car can be constructed with a metal under-frame for about \$10 additional cost and about 5,000 lbs. saving in total weight.

There is already some controversy regarding the best methods of construction of steel frames. One of the most disputed points is whether a bolted or riveted frame is better. A little reflection will show that with proper apparatus a rivet can be placed in position quicker and will fill the holes better than a bolt. Generally a rivet can be taken out quicker than a bolt can be removed if the nuts fit as they should. For this class of work the nut should fit the bolt so closely that it would require a wrench to turn it on the entire distance; otherwise they will rattle loose and come off.

The experience in all foreign nations is that, except in the case of bad wrecks, but few running repairs are necessary. Periodically the cars are inspected for loose joints and deterioration, and in Germany the great durability of the metal frame has enabled the reduction of the car repairs to such a complete system that a record of the condition of each car is kept, and repairs are only made when ordered from headquarters. There are no small repairs, such as the renewal of draft timbers, transoms, bolts, etc. Generally the work consists of a complete overhauling of the superstructure, roofs and buffers. The under-frames are now, after fifteen or twenty years' use, in as good condition as when first put in service. The limit of life of a steel under-frame has not been determined. It has been estimated, however, that unless the development of the service demands a change in the design of cars the life will be from fifty to eighty years. This could not be true of stock and refrigerator cars, unless some means were provided for keeping the moisture away from the tops of the sills.

The introduction of steel for car framing here has been hindered by the enthusiasm of those who have proposed it. Generally they have advocated a too radical change, such as the construction of steel floors, linings and sidings. The time has not come for these, and it is doubtful if the American method of railroad operation will ever permit the use of a steel floor. A wooden floor is necessary, in order that cleats and braces may be nailed thereon to keep merchandise from shifting in transit. A metal superstructure, floor, siding and lining will not be generally used until long after metal sills are common.

One of the most radical improvements in the general construction of freight cars and a long step toward the introduction of a better under-frame made of steel, is shown [cut not received.—EDITOR.] where it will be seen that the draft sills have been removed and the floor of the car dropped so that the centre sill

occupies the position formerly occupied by the draft sills. The advantages are as follows: The centre line of draft is above the bottom of the sill. With the same height over all the car has nearly 8 ins. increased clear height inside. By this construction a full load of oats and furniture and other light freight can be carried without exceeding the reasonable height of cars. If steel sills were to be substituted for the wood centre sills only in this design, the result would be a decidedly stronger and more durable under-frame and a continuous steel draft rigging. There would be no wood on the line of draft throughout the train.

Body Bolsters.—Probably the advance in construction of the body bolsters is as marked as that of any other detail of freight cars. Formerly they were made of a single piece of timber, as shown in fig. 1. Such bolsters served admirably at the time they were made, but they soon became inadequate to withstand the shocks of service, and naturally enough an iron bolster was used. The latest and best form is that used by the Chicago, Burlington & Quincy Railroad. See fig. 2. The ends of the top member of the body bolster are bent down to carry the side sills, as shown. This is probably the strongest form of body bolster now used. It is not unlike one that has been proposed for the metal under-frames shown in fig. 6; but for metal framing it is much better to use a wider bolster than 8 or 9 in. The one shown in fig. 6 is 15 in. wide and has a corrugation in the centre of its width to stiffen it.

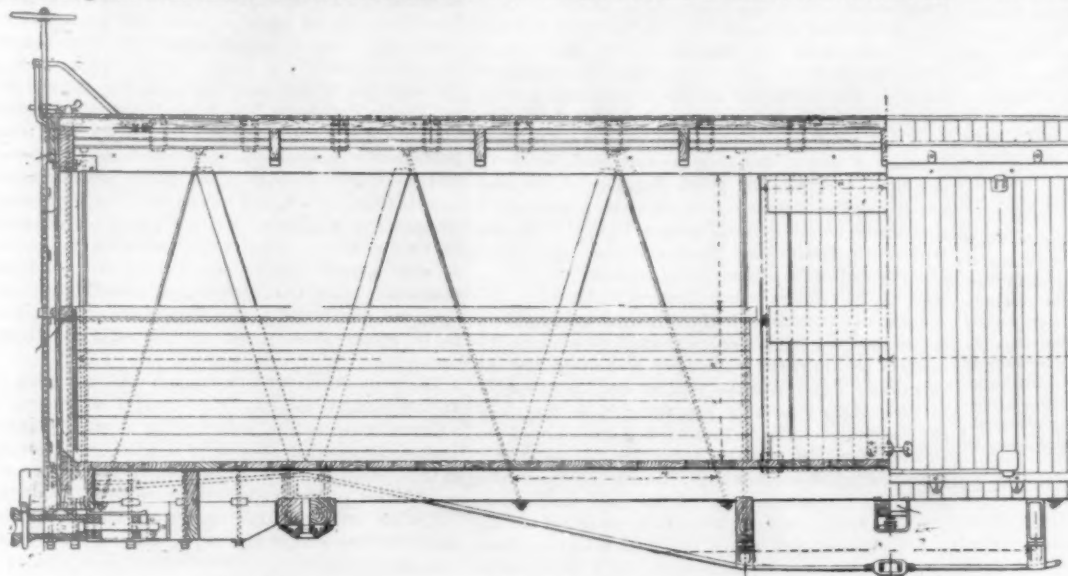


Fig. 9.

The plate of which it is made is but $\frac{7}{8}$ in. thick. Its weight is about the same as a 9-in. bolster of the ordinary form. The introduction of metal under-frames will necessarily change considerably the detailed construction of the bolsters, as a wide bolster is of great assistance in keeping an under-frame square. Always in riveted work the thinner the sheets the better the rivets will hold, and a wide thin bolster is more secure than a narrow thick one; it has more rivets, and the rivets can be made to better fill the holes.

Draft Rigging.—The most expensive detail in point of repair is the draft rigging. The old form with cast iron stops secured to the wooden sill by means of bolts is shown in fig. 7. This construction is practically worthless now. It will not stand ordinary service without fracture. When it breaks the result is almost invariably broken or splintered sills. Since the time this was generally used there have been many changes. Probably the first was the use of projections cast on these stops, which were inserted in recesses formed in the sides of the sills. Then both stops were cast in one piece of cast iron. Cast iron was found to be inadequate, and malleable iron, wrought iron, pressed steel, and cast steel are now generally used instead. In general all latter forms of drawbar stops are made in what is equivalent to one piece, and have a wide bearing on the sills. In this way there is more than double the security of attachments between the stops and the sills, and more than double the resistance to the blows and shocks on the drawbar. All are familiar with the different forms of drawbar stops that are for sale as they are generally shown in the advertising columns of the technical papers. Nearly all of them are good, and every one of them is an improvement over the old form.

There is one type of drawbar stop which has not been illustrated, but which is admirable for its simplicity and low cost. It embodies all the fundamental principles of the latest forms of this detail of car construction, and has been in use long enough to prove its merits. It is shown in fig. 8. A comparison of this with the other and older form shows the progress made in drawbar attachments. It is composed essentially of two parts, a face plate which protects the centre sill, or draft sill, as the case may be, and secures the two end stops together. This piece has a projection which is recessed into the face of the sill. There are the usual top and bottom binders which hold the draft springs in position, but these have in this device no office in adding to the strength of the construction as they do in a design such as fig. 7 of the old type. The bolts which pass through the face plate and the stops together with the lip on the ends of the face plate serve to hold both stops together and distribute the buffing strains over all of the bolts, and make it thus equivalent of one integral attachment. The parts of this are all made in the ordinary bulldozer or bending machine.

To show the comparative value of the new and the old, it is only necessary to state that the modern draft gear never breaks; it bends, and the resistance to rupture when attached to a wooden sill is more than 150,000 pounds, while the old type has less than 80,000. The increase in strength is nearly 100 per cent., and a natural inference would be that by the use of such devices the decrease in the cost of repairs would be under the same conditions about 50 per cent.

But although the modern draft rigging is much stronger than the older form, the repairs are not less than they formerly were, and this is because of the increase of the shocks of service due to use of heavier

locomotives and heavier cars. The modern draft rigging is as strong as it ever need be made for wooden sills. When a rupture occurs now it is the still that cracks and splinters, and not the draft rigging that breaks.

Formerly the draft sills were strong enough when secured to the longitudinal sill only by vertical bolts. See fig. 7. Keys between the two were later substituted to assist the bolts. When the strains became too heavy for both the keys and bolts, then the sills were extended back to the transoms. See fig. 8. Soon this was insufficient, and the transoms were displaced by the blows that the cars received, and a sub-sill, now commonly used, was introduced between the transoms to prevent their displacement, thus making what is, in fact, nothing more than a double centre sill throughout the car from end to end, one sill lying under the other. This is the present construction.

Another defect was found in the old form resulting from the location of the centre line of draft below the sill. The blow taken by the drawbar being below the sill, as shown in fig. 9, tended to double the cars up by bulging over the centre, particularly in the case of flats. The use of a sub-sill, before referred to, prevents this. The equivalent of this is found in the latest form of the C. B. & Q. 60,000-pound cars, which is now the standard of that road. This design is shown in figs. 2, 8 and 10, which illustrate how the drawbar is passed through the end sill and is located so that the line of draft and

shock lies above the bottom of the sills, and in such position as to give the cars a maximum resistance as to shock. The method of supporting the drawbar and strengthening the end sills to permit this construction is clearly shown.

With regard to the resistance of the draft rigging to shocks, something must be said about the additional provision for resisting heavy blows that is now made. Formerly the draft rigging itself received the entire shock. Two loaded cars moving together with a speed of one and a half miles per hour will close up the draft springs on both cars, and all blows greater than this must be resisted by the draft rigging itself unless some further provision is made. It has now become general practice to cast a flange on the top side of couplers which strikes against a wooden block bolted to the end sills whenever the shocks are sufficient to close the draught spring. Probably this flange comes against the end sill nine times out of ten when cars are coupled together. It is this flange which must in the future, as it does now, receive and care for almost the entire shock incident to coupling cars. Without it, the best draught rigging that can be made and attached to wooden sills cannot be made to stand. Hence we may conclude that the draught gear should be made to withstand the pulling strains and the flange on the drawhead to resist the buffing blows.

It follows as a matter of course that the draw bar stop or flange should come against the end sill before the draft springs are closed up; but this important feature has been overlooked, and unfortunately the full advantages of the flange on the drawhead as a protection to the draft rigging have not been realized. The springs close up solid on new cars when the flange is against the end sills, with the result that when the end sills are driven in slightly by the flange on the drawhead, the draw gear takes a large proportion of the buffing blows. It is logical, then, to reason that the distance between the flange on the draw and end sill when the draft spring is uncompressed should be about three-fourths of an inch less than the movement of the spring. This would allow an indentation of end sills as much as three-fourths of an inch before the draft rigging would receive any severe shocks.

Some unscrupulous car builders allow the flange of the drawhead to come against the wooden stops without the interposition of any protection plate. We have all seen these cars after a little service. The wooden stop is pounded away from one to two inches deep, and on such cars the draft rigging will always be found to be out of order and driven back out of proper position. It is needless to add that a draft rigging cannot be made to stand under such conditions.

Some attempts have been made to reduce the effect of shocks by increasing the capacity of the draft springs, and the absorption of the shocks by friction and compressed air buffers. This step, while good for other reasons, is wholly inadequate to serve the purpose intended. It gives in general better results in pulling trains by reason of the increased spring slack, but has no advantage to resist the heavy shocks. It is impossible to use a spring with a capacity that will make it equivalent in absorbing shocks to the wooden sills when struck by the flange on the draw head. Again, such a heavy spring as would be required to be of material value in absorbing shocks would have a recoil after being struck which would be disastrous not only to the cars themselves, but to their contents. A wooden buffer has practically no recoil.

(TO BE CONTINUED.)

Facilities for the Interchange of Traffic Under the Interstate Commerce Act.

BY LAWRENCE GODKIN.

It is proposed in this article to examine, in the light afforded by the decisions of our Commission and Courts and of the English Railway Commissioners, the duties and obligations imposed by the Interstate Commerce Act on common carrier corporations in their relations with each other, in respect to the interchange of traffic. The third section of the Act reads as follows:

Sec. 3. That it shall be unlawful for any common carrier subject to the provisions of this Act to make or give any undue or unreasonable preference or advantage to any particular person, company, firm, corporation, or locality, or any particular description of traffic, in any respect whatsoever, or to subject any particular person, company, firm, corporation, or locality, or any particular description of traffic, to any undue or unreasonable prejudice or disadvantage in any respect whatsoever.

Every common carrier subject to the provisions of this act shall, according to their respective powers, afford all reasonable, proper, and equal facilities for the interchange of traffic between their respective lines, and for the receiving, forwarding, and delivering of passengers and property to and from their several lines, and those connecting therewith, and shall not discriminate in their rates and charges between such connecting lines, but this shall not be construed as requiring any such common carrier to give the use of its tracks or terminal facilities to another carrier engaged in like business.

It will be observed that the second paragraph of this section is the one which relates in express terms to facilities for the interchange of traffic. But the matter may also be considered as covered by the language of the first paragraph, for the giving or withholding of such facilities would constitute a case of undue or unreasonable preference or advantage, prejudice or disadvantage. In other words, the second paragraph of the section specifically and positively applies to interchange of traffic by common carriers, the general prohibitive injunction contained in the first paragraph. For the word "facilities" in the second paragraph of the section, has been construed as including in its definition rates and charges for transportation.¹ And since this construction has been given to the word, it is apparent that the positive duty of affording "equal facilities" for the interchange of traffic, includes by implication a prohibition, in respect to interchange of traffic, against the matters prohibited in the

first paragraph of this section, to wit, making or giving or subjecting to any undue or unreasonable preference or advantage, prejudice or disadvantage or discriminating in rates and charges between connecting lines.

In its ultimate analysis therefore, and stripped of repetitions verbiage it will be found that the third section of the Act imposes two duties upon common carriers in their dealings with each other in respect to interchange of traffic namely:

1. To afford reasonable and proper facilities for interchange of traffic.
2. To afford equal facilities for the interchange of traffic.

The requirement of equal facilities is nothing more than a statutory declaration of the common law on the subject. The courts already held before the passage of the act that carriers must give equal service on equal terms to all common carriers who applied to them.²

The second paragraph of the third section of the Act is modeled in part upon the English statute, and in part upon the American State statutes in existence at the time the Interstate Commerce Act was passed. Its purpose, as stated by Senator Cullom in Congress was "to require railroads to furnish connecting roads all reasonable and proper facilities for the interchange of traffic that may be necessary for the convenience of the public, and to prevent one road or combination of roads from 'freezing out' a connecting line by refusing to accept traffic from it, or deliver traffic to it, upon any terms, as has been done."³

The English statutes from which much of the language of our Act has been copied are the English Railway and Canal Traffic Act of 1854 (17 and 18 Vict., Chap. 31) and the Regulation of Railroads Act of 1873 (36 and 37 Vict., Chap. 48). Some provisions of the American Act will be found upon examination to have been copied almost literally from the English Acts, and for this reason some of the decisions of the English courts and Railway Commissioners have become of peculiar importance under the well known canon of statutory construction that where British statutes have been adopted into our own legislation, the interpretation of those statutes by British courts will be considered as silently incorporated into

(Continued on page 85.)

¹New York & Northern R. R. Co. vs. N. Y. & N. E. R. R. 41, C. C. R. 702.

²Denver & New Orleans R. Co. vs. Atchinson, T. & S. F. R. Co., 15 Fed. Rep., p. 650.

³Painter's Interstate Commerce Debates.



ESTABLISHED IN APRIL, 1866.

Published Every Friday.

At 73 Broadway, New York.

The subscription price is \$4.20 a year in North America, and \$6.00 in foreign countries.

EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in his journal for pay, EXCEPT IN THE ADVERTISING COLUMN. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The acquisition of the Poughkeepsie bridge and its connecting railroads by the Philadelphia & Reading, which seems to be assured, will doubtless be a good thing for the bridge route and probably profitable, in the long run, to the Reading, though no one can predict any immediate change of importance. The Reading does well to secure an all-rail line to New England, and the shipment of coal from the mines to its final destination by rail is likely to become more profitable and more general rather than less so; but it remains true that the Central New England & Western, even with the Boston & Maine and other friendly lines added, as yet reaches only a very small percentage of the manufacturing centres of New England, and that coal can be carried from Perth Amboy to Boston by water and thence inland a long distance by rail at rates below the cost, from the mines direct, over a hilly and circuitous railroad.

The automatic electric signals on the Providence & Worcester division of the New York, Providence & Boston Railroad do not cover the entire road; numerous spaces between stations have no signals whatever, and trains running through these spaces are not protected by any electric signal, or any fixed signal of any kind. This was clear enough from the statements of the *Railroad Gazette* of Jan. 8 and 22, and of Chief Engineer Dawley, as printed in *Engineering News*. But that paper on Jan. 23 came out with another statement, in which the contradictory character of the assertions made was more glaring than ever. A map was printed, made on the principle shown in the sketch herewith, showing the 44 miles of road under discussion, and under it were the words, "The solid black indicates parts of line protected by automatic electric block signals." These words corresponded with Mr. Dawley's accompanying statement. But the editor goes on to say that the other parts are "protected in about the same way;" that the track circuit is chiefly to detect broken rails, misplaced switches, etc., and that trains are protected from each other as perfectly on the open sections as on the black, "since the signals are connected together electrically as a continuous series." This connection would, of course, have to be by wire on poles or in a cable. In the editorial column we are conditionally pardoned for our error in trying to "block the progress of a needed reform." But as our contemporary's readers have a right to know the unclouded truth, we troubled Mr. Dawley with one more inquiry, and present the result herewith. The electrotype of the illustration will be freely lent to our contemporary on application.

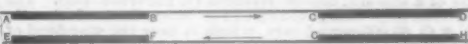
[From the Editor of the *Railroad Gazette* to Mr. Dawley.]I have just read your letter in *Engineering News* of Jan. 23, accompanied by a map showing the portions of

your track protected by automatic electric block signals in heavy black sections. As the statements printed below the map conflict with what you say on the subject, I beg to ask that you will state specifically whether each train, as it enters one of the white sections, is protected, by the automatic action of the signal, against a following train. And is this protection afforded by "the signals being connected together electrically as a continuous series?" None of the previous statements, either of Mr. Chamberlain or yourself or of any journal, have made mention of this fact.

Moreover, that the matter may be perfectly clear, I beg to ask your attention to the enclosed diagram, in which I have sketched a portion of the road, showing the sections covered by track circuits in heavy lines. Referring now to the sketch, what sort of a signal exists at B, and how is it operated by a train proceeding from B toward C? And if a train running between B and C is protected by a signal, located either at B or A, how does

South Worcester.

Millbury.



the train return the signal to the all-clear position after it reaches C?

The sketch was returned with the following notation made upon it by Mr. Dawley: "No signal at B. Train running from B to C is not protected by any block signal." The statements in the accompanying letter tell nothing new. It only remains to add that the map in *Engineering News* shows ten such spaces as that between B and C besides some very short ones. To sum up in a word: The Chief Engineer of the road and the *Railroad Gazette* said that there was not a continuous block system between Valley Falls and Worcester; *Engineering News* said there was. And now our end of the schooner is at anchor.

For many years an able committee of the American Society of Civil Engineers has worked to advance the cause of reform in the methods of reckoning and noting time. From year to year we have recorded the progress of the reform as appearing in the reports of the Committee. The last report is a summary of the Committee's work from the beginning and we print it nearly in full on another page, for its historical value and its concise presentation of the present situation. The system of reckoning time from standard meridians an hour apart was a practical reform of great utility. That was introduced in the United States principally by the action of the railroads, on the suggestion of this Committee. The progress made elsewhere in the introduction of the same system is outlined in the report. The Committee has from year to year called the attention of the Society to the advantages of the 24-hour system of notation and that has for some years been the official system of the Society. But it has not made any progress in popular use and has made little in railroad time tables. It is used on a large part of the Canadian Pacific system, on the railroads of India and to a very limited extent elsewhere. At the recent annual meeting of the American Society of Civil Engineers a resolution was adopted authorizing the Committee to take steps to invite the railroads of the United States, Canada and Mexico to adopt the 24-hour system on the 12th of next October. This is thought to be a peculiarly appropriate date as the 24-hour notation is essentially Italian in its origin and it would be a compliment to the native land of Columbus to adopt it here on the 400th anniversary of his discovery of America. Probably the attention of the railroad officers will be called to this matter through one of the standing committees of the American Railway Association which promised last October to get an expression of opinion to be submitted at the April meeting of the association. This we trust will be done. While the 24-hour notation is not of nearly as much practical importance as the standard meridian system of reckoning time it is a decided convenience. It has long had the approval of a large percentage of the higher railroad officers of the country. Now all that remains is for them to make a concerted movement to bring it into use.

The demurrage reform, which has resulted in such marked benefits at numerous large cities during the last three years, found a specially inviting field at Minneapolis, where there is such a large single interest that handles bulk freight; and the experience of the roads in that region is told on another page of this issue. Although the general results are not different from those accomplished at other places, the work done deserves to be recorded, and various details in our account will be of special interest to all officers interested in demurrage. The salient fact is the change in the rate, which was made when the demand for cars began to grow urgent. Indeed this is, in our opinion, a vital principle if the demurrage system is to be a permanently valuable feature of railroad operation. The past success of demurrage associations, good as it has been, has been achieved only in spots, so to speak, and there is yet much more land to conquer; but to

consistently cover the whole field the far-reaching laws of supply and demand must be fully recognized. When cars are standing everywhere idle, demurrage charges are legitimate only as a means of facilitating work and economizing yard room, and they cannot be heavy. When cars are worth \$10 or more a day, the demurrage charge should be as high as a due regard for the rights of the consignee will allow. Means should be taken to make this variation in rate, as often as is necessary, without undue friction. To the fact that it has been made, informally, in a great many cases, is doubtless due a considerable measure of the success hitherto attained.

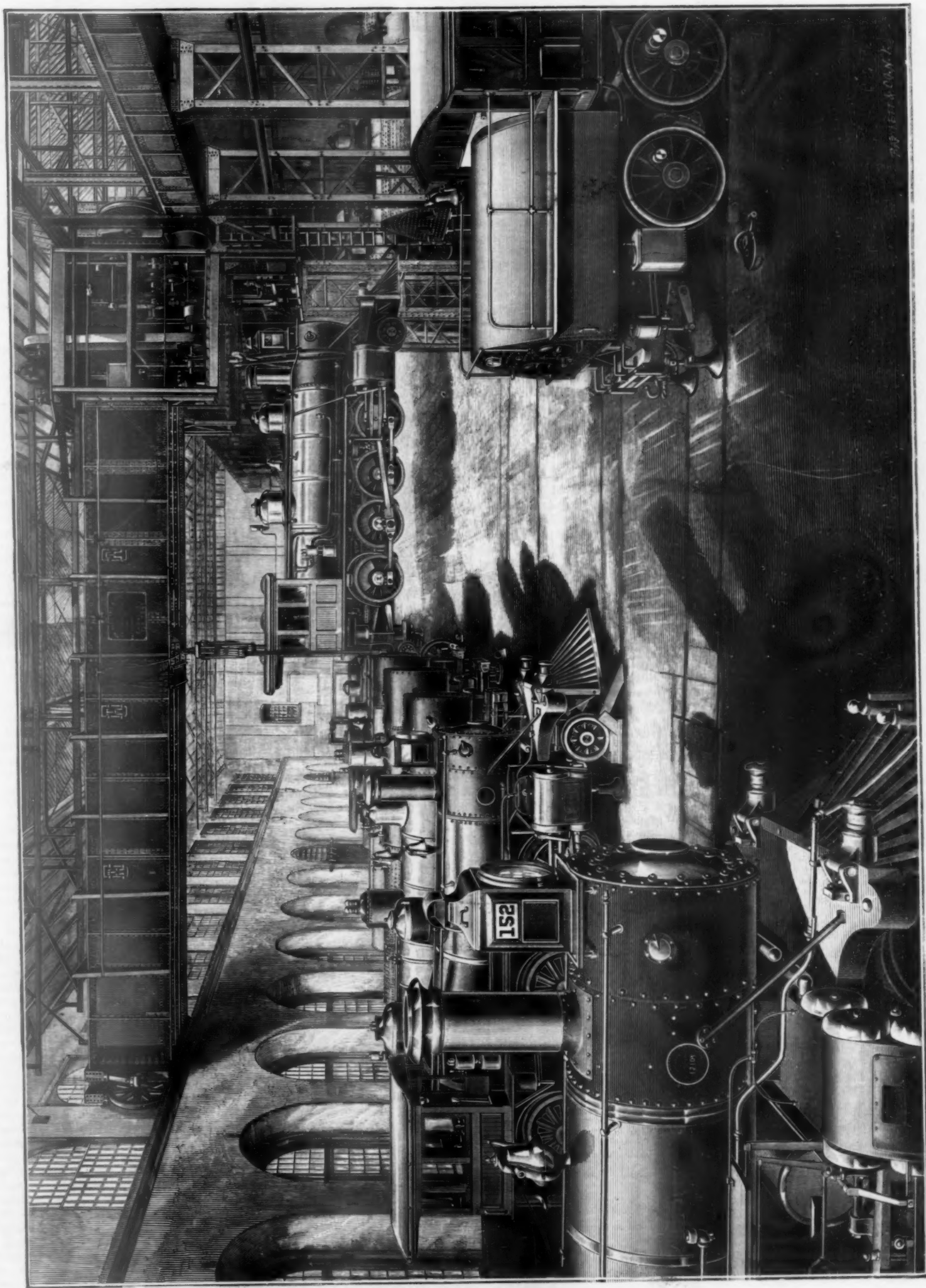
Car Service Settlements.

We ask especial attention to the report in another column of the recent meeting of the American Railway Association's Committee on Car Service. The plan of settlement of car service balances that appears to have been agreed upon is half a cent a mile and six cents a day, and it was decided to take steps to have this plan adopted by as many companies as possible at the beginning of the next fiscal year, July 1, 1892. We say *appears* to have been agreed upon, for the exact form of the committee's report has not yet been made public. We have good reason to believe, however, that this will be the basis of settlement recommended, and that immediate steps will be taken to get enough adherents to the plan to warrant putting it into force next July. All but two of the Committee were present, as were a number of the members of the Per Diem Committee of the Car Accountants' Association, therefore we may take the action of the conference as fairly representative; and if it is so, it is fairly encouraging.

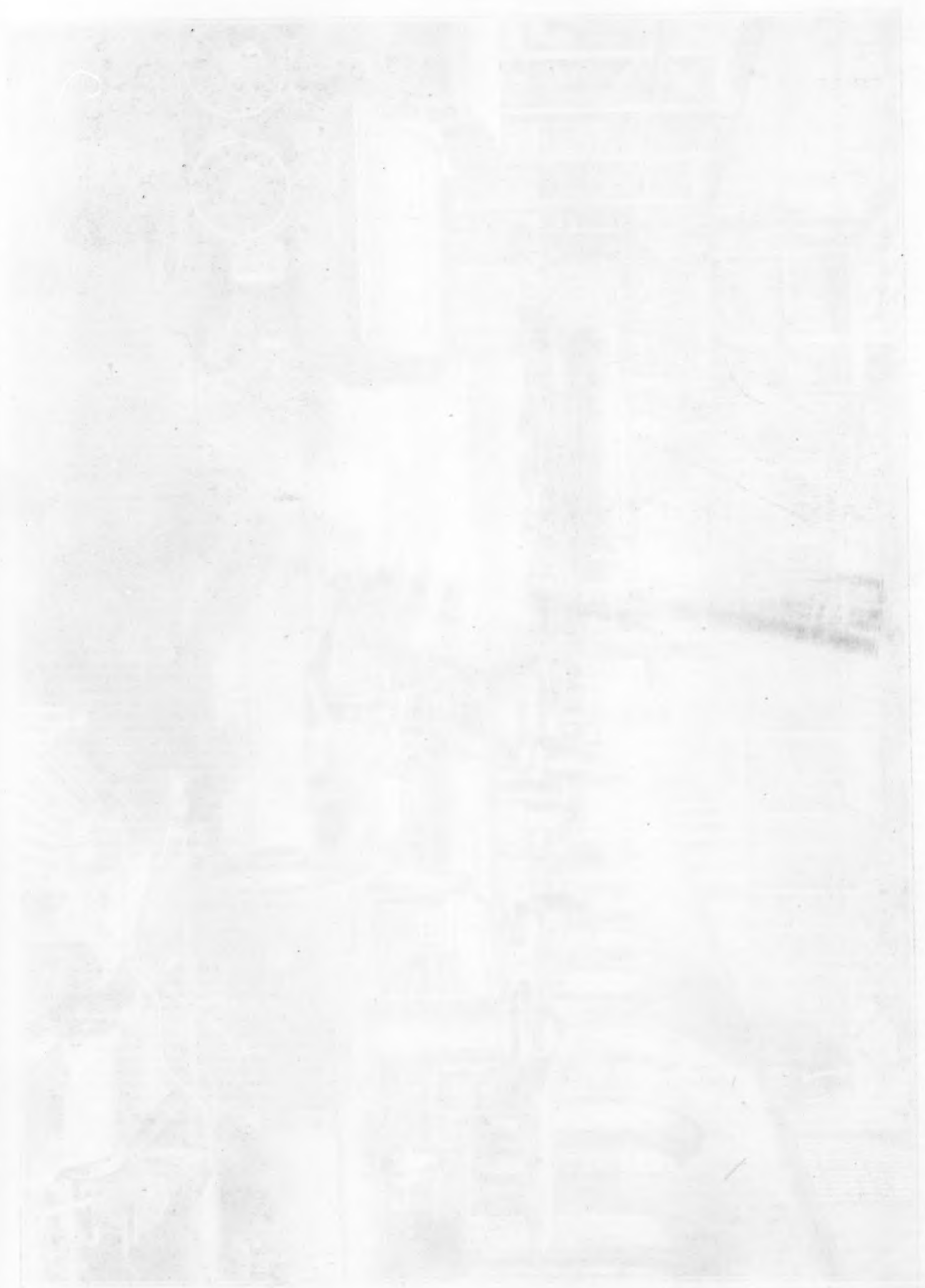
The propositions are as reasonable and moderate as anyone ought to ask for. The basis of settlement is adjusted so as not to increase the average balance against borrowers if they keep foreign cars moving at the average rate of 24 miles a day; and it is proposed to ask the railroads to try it for only 12 months.

It is too late in the century to say much about the enormous importance of getting more service out of freight equipment; or about the difficulties of making a reform. Those matters have been thrashed over very thoroughly in the last 10 or 12 years. The extent of the use and abuse of borrowed cars is common knowledge; and it has been estimated that the permanent investment in cars that would not be needed if their mileage were doubled, and in side tracks to hold idle cars, and motive power to handle surplus stock, amounts to at least \$290,000,000. The loss of interest and the waste in depreciation and repairs make up a tremendous item of possible economy. This great investment is not without some advantages, of course. Cars make handy storehouses for your customers' goods, especially if they belong to someone else and if you do not have to pay any rent for them. But, unfortunately, while you are pirating A's cars C is pirating yours, so in the end you gain nothing, but on the contrary have to contribute your part toward about the most expensive system of warehousing that could be invented. The difference in cost of storage per cubic unit, in cars and in warehouses, taking into account the ground occupied and the cost of the foundations (the track in the case of cars), is in the aggregate a colossal figure; yet, so long as the railroads allow their cars to be used for storehouses they must lose this difference; the public does not pay it, even indirectly. It is not at all certain, in fact, that stealing your neighbor's cars and sending them into the wheat fields to wait there a month or two till the wheat is thrashed is the cheapest way of getting a share of that business. It is quite possible that country elevators would answer the same purpose and be cheaper.

The absolute waste from the present unscientific use of freight cars is variously estimated at from \$25,000,000 to \$50,000,000 a year. As we said above the railroads lose this and not the public. We do not say that all this could be saved, or even half of it, by "per diem" or by per diem backed up by the efficient and extremely useful work of the car service associations at terminals and junctions. We do not say that "straight per diem" or a mixed per diem and mileage basis of settlement is the ideal plan or will be permanent; but nothing else so good and so promising has ever been seriously proposed,—much less brought to the point of actual trial in practice. Therefore, those railroad officers who really want to administer the properties under their charge in a strictly business way and get a maximum product at a minimum cost will not have done their duty by those properties until they have given a thorough trial to the plan put forward by the American Railway Association's Committee. And this seems a particularly good time to



ONE-HUNDRED-TON CRANE, ELECTRICALLY OPERATED—BALDWIN LOCOMOTIVE WORKS.



try it. There is a certainty of abundant business and a probability of a scarcity of cars for a long time to come. The importunities and the exigencies of the traffic department will, therefore, be less than usual, and the chances of good faith among the different railroads rather better than usual. It looks like an uncommonly good opportunity for the railroads of physical and moral backbone to make the experiment of using what cars they own instead of buying more to stand on some one else's side tracks.

Some of the Troubles of Operators.

The telegraph operator's letter printed in another column makes an appeal which is based on right principles, and is not without weight, though the argument is overdrawn in some respects. While we fully realize the shortcomings of the railroad companies in this matter, and heartily sympathize with our correspondent and those he represents, in their desire to better themselves, we can only touch upon a few of the principal points in the question he brings up, for to discuss it with any show of completeness would involve an inquiry into the entire field of the employment question. We cannot speak of the West Shore in particular (except to say that it is poor, and so is tempted to scrimp worse than some others) but must consider roads in general.

Operators are employed who are too young and inexperienced. Sufficient effort is not made to guard against the dangers due to their youth or to give them right and profitable experience. A marked instance of this was published by the New York Railroad Commissioners in its annual report for last year. The station agents' association has agitated this subject somewhat, especially in Ohio; and claims, not without a good deal of evidence, that poorly trained operators handle train orders in a great many offices. It is true also that railroad officers more carefully grade trainmen than they do operators. Superintendents and train masters who give gruff replies are still far more numerous than they ought to be, indicating that more care ought to be given to selecting men for such places; but we think managers are improving somewhat in this respect, and "Ajax" must bear in mind that a good deal of the money that he and his brethren want will have to go to these higher employés if the companies aim to get that rare sort of man who is kind and amiable while at the same time gifted with the energy necessary to run a railroad.

But as against these considerations most railroad officers have, in their minds, what they feel to be a pretty strong justification of their course, though it is not easy in every case to clearly state it. As to safety in transmitting messages, they try to get competent dispatchers and they believe that the duplicate order system, with proper regulations, enables a good dispatcher to handle trains safely even with a poor operator. This view is not wholly confirmed by experience, but it is sufficiently confirmed to lead superintendents to use their money, which might go to secure better operators, in other directions, where they believe there is still greater need of improving the service. The reason they do not have money for these purposes is, in some cases, lack of earnings; in others, the feeling of the directors that as long as their reputation for safe operating is no worse than that of the generality of roads, they are justified in taking the money as profits. The shortsightedness which takes this view instead of building up a perfect service (which will cost more money now but will be more profitable in the future) has often been reprehended in these columns.

Our correspondent should not lay too much stress on mere proficiency as an operator, important as that is, for the fault with operators is of a more general nature. Collisions occur by reason of forgetfulness; of errors of judgment which are chargeable not to the person who made them but to the officer who, being older, knew the danger and ought not to have made the appointment; and because of general moral inefficiency. These defects are not peculiar to telegraph operators. An operator needs the strength of character to keep awake under a sense of duty when he desires to sleep; to hold engineers to the rules even if it involves "unpleasantness" with a disagreeable person. He needs the good judgment that will keep him from neglecting a train order even if a dozen saucy passengers are pestering him. These qualities of character are needed, however, in other places, as we have said. We agree with "Ajax" that railroads ought to pay more money and get more men of that kind. But even if they do it, grading is very difficult in station work. To pay a man more because he is more capable, but before the company has a higher place for him, is a thing we cannot expect until we have more

angels and fewer financiers among railroad owners. Promotions accompanied by a 25 per cent. increase (or even five per cent.), must be very rare, except in a new country. Promotion from one station to another is often a difficult matter to arrange, especially where a man has a family and the increase is small; while promotion from one train to another is generally very easy. Benevolent minded superintendents have tried to favor station men in this way, but with the limitations placed by the directors on the expenditures, they generally find it up-hill work.

But most of an operators' misfortunes are due to causes outside of all these. The telegraph was new only 45 years ago, and the era of high wages incident to a new industry has only fairly passed. The country was likewise new up to a few years ago; but now it has assumed the characteristics of an old one. There are two qualified applicants for one place where there were formerly two places for each good man. There is no help for this but to murder infants and immigrants. A hundred operators scattered over 500 miles cannot combine against an unreasonable employer as can the same number of engineers all living in one place. This is also irremediable. Moreover, there is no use in an operator's shutting his eyes to the fact that a road can do a considerable business without operators while it can not do a stitch without engineers. As long as railroads are run for profit it is futile to expect directors not to take advantage of this fact.

Fourteen hours a day, or even 12, seven days in a week, is too long working time in one line of indoor work; but as long as there are plenty of men willing to work 15 hours for the same pay the outlook for improvement is poor. But railroads must largely blame themselves for the tendency to restrictive legislation, as long as their employés, thus worked, have constantly before them the spectacle of other employés, banded in unions, getting equal or better pay for 10 hours a day, six days in a week. It is only to be expected that the overworked men will enlist the sympathy of legislators and of the public generally.

Train Accidents in 1891.

We print herewith the table giving our usual annual summary of train accidents as published in the *Railroad Gazette* monthly during the year, together with the statistics for the previous 18 years that these records have been kept. The totals of accidents and of the various kinds of accidents, as well as the total casualties, do not show sufficiently marked differences from those of former years to call for special comment. The number of persons killed per million train miles has been computed and added to our ten-year table. As we have heretofore explained, neither these figures nor the others relating to casualties are of great value for comparison with those issued by the Interstate Commerce Commission, even if the years for which they are gathered were the same, as the classification adopted by the Commission makes it impossible to compare "other accidents" and accidents to "other" persons. The total number of persons killed, in our table, includes a considerable number of tramps and "other persons," as will be seen by the five-year table of casualties; and the train mileage does not include switching and work trains. Nevertheless the averages will not be without interest.

The statement that the totals are not unusual is perhaps subject to modification as regards derailments caused by malicious obstructions and those caused by misplaced switches. It will be seen that the number of the former, 42, is more than 50 per cent. larger than in 1890, and more than twice as great as in any year before that. We have no accurate statistics on this point and can only judge by the general impression produced by reading the newspaper accounts in the course of the year, but this impression certainly goes to substantiate the accuracy of the figures; that is to say, there seems to have been a marked increase in 1891 over former years. The arrest and imprisonment of a crazy man who succeeded in derailing two or three trains, and the slaughter of 18 passengers at Statesville, N. C., in August, by a wreck which is currently attributed to malicious derailment, are marked incidents of the year. Several other train wreckers have been imprisoned.

The number of misplaced switches, 78, is 6 less than the average for the six years 1870-84, and is only 2 more than the average for the five years 1873-77. In view of the increase in railroad mileage and train mileage during these years this seems to be a marked improvement in the record. Increased safety may have been attained by better discipline, by the substitution of split for stub switches, or by the introduction of interlocked distant signals. Which cause preponderates would be hard to say. Doubtless there are circumstances within the experience of many superintendents tending to throw light on this question; we should be glad to hear from them.

The most serious train accidents of the year, arranged in the order of their importance, as reckoned by the number of persons killed, were the following: Ravenna

O., July 3, killed 21; Statesville, N. C., Aug. 27, killed 18; Hastings, N. Y., Dec. 27, killed 15; Montezuma, N. Y., Aug. 5, killed 14; Charleston, W. Va., July 4, killed 14; Aspen Junction, Colo., July 11, killed 9; Toledo, O., Nov. 28, killed 9; Kipton, O., April 18, killed 6; Fourth Avenue Tunnel, New York City, Feb. 20, killed 6. To recapitulate even the main features of these calamities, and of others the morals of which are equally instructive, would require a four-column reprint of our monthly reviews, and the reader must therefore be referred to those for further details. The total number of deaths charged to these nine accidents is 112; 100 were passengers, this number being equal to 56 per cent. of the total number of passengers killed in train accidents.

Except as noted above, the year 1891 does not seem to be specially noticeable, as compared with its predecessors, unless perhaps it is in the fact that America is beginning to have train accidents under the block system, and where signals are interlocked, as well as under the older and more familiar conditions. It is not necessary to repeat here the obvious truth that discipline is a vital element in railroad working, even with the most perfect appliances, nor to warn railroad managers that the introduction of these safeguards, greatly enhancing the safety of trains, does not absolve them from attending conscientiously to other well known requirements which are essential to perfect service.

Whatever may be said about the inefficiency and the evil connected with state control of railroads in this country (and much may be said), there is undeniably one great reason why there ought to be a railroad commission, composed of gentlemen of high character and suitable training, in every state, and that is to give publicity to railroad affairs. This need is not a new one, and we are not unmindful of the obstacles to successfully meeting it; but in three of the serious accidents just recounted, as well as in a number of lesser cases, it was especially apparent. The bridge disaster near Charlestown, W. Va., on July 4, was undoubtedly the result of causes which are disgraceful to all concerned in them, whether it be the owners of the road, the state which regulates (or should regulate) it, or the railroad profession generally; but West Virginia has no railroad commissioners, and no careful or thorough investigation seems to have been made. The Aspen Junction case was also one that ought to have been fully aired by a technical expert. Colorado has a railroad commissioner, but it appears that the law which was intended to clothe him with authority does not amount to much. North Carolina has a board of railroad commissioners (comparatively new), but the public is still waiting for their report on the Statesville disaster. This case especially demanded impartial investigation by a public body for the reason that aspersions were cast upon the motives of the railroad officers, and their attitude toward the public. Ohio, in which occurred the Ravenna collision, not thoroughly investigated, and the Kipton collision, the lesson of which was not properly set forth, has a railroad commissioner and he is assisted by an inspector, but both men apparently lack the time, the authority or the special ability to unravel the intricate and sometimes obscure causes of disasters which result from negligence in several different departments. Maryland stands in need of a railroad commission for the same reason that West Virginia does, a disgraceful trestle failure having occurred at Fallston in that state in April.

Accidents on "dummy" railroads, as also collisions between the trains of ordinary steam railroads and those of electric street car lines, have come to be of frequent occurrence, and the question arises every month whether some accident of this kind should not be included in our record. In Alabama where "dummy" roads are numerous they are not treated by the railroad commissioner as full-fledged railroads. The increase of street car lines, and the high speed at which the cars are run, makes every demand for a grade crossing with a steam railroad a serious matter. These demands have been stoutly resisted by conservative railroad managers, but county and municipal authorities have not thus far evinced an adequate appreciation of the danger. If they continue to permit the laying of tracks across railroads at any and every street where there is a demand for them railroad officers will have to face the question of interlocking signals at such crossings.

The classification of the casualties of 1891 according to the kind of accident in which they occurred is as follows:

KILLED.	Employés.	Passengers.	Other persons.	Total.
In collisions.....	299	108	34	441
In derailments.....	208	67	29	304
In other accidents..	43	2	..	45
Total.....	550	177	63	790
Total 1890.....	609	172	65	846
Total 1889.....	336	108	48	492
Total 1888.....	434	168	65	667
Total 1887.....	406	207	43	656

INJURED.	Employés.	Passengers.	Other persons.	Total.
In collisions.....	874	469	31	1,374
In derailments.....	542	768	20	1,330
In other accidents..	31	5	1	37
Total.....	1,447	1,242	52	2,741
Total 1890.....	1,519	1,224	60	2,803
Total 1889.....	978	745	49	1,772
Total 1888.....	1,056	1,012	94	2,162
Total 1887.....	890	916	140	1,946

The number of persons killed and injured in train ac-

TRAIN ACCIDENTS—THEIR NATURE AND CAUSES, FOR NINETEEN YEARS.

	1891.	1890.	1889.	1888.	1887.	1886.	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1873-7
TRAIN MILEAGE in the U. S. in millions of train miles.	875.0	793.9	722.0	688.8	644.0	569.8	560.9	541.3	538.0	476.0					
COLLISIONS:															
Rear.....	555	485	379	404	362	338	316	288	413	385	360	274	308	141	155
Butting.....	284	323	200	311	309	127	120	138	177	160	140	141	86	70	96
Crossing and miscellaneous.....	296	223	110	89	26	36	28	27	30	33	24	21	10	8	43
Total collisions.....	1,137	1,041	749	804	706	501	464	445	620	561	536	437	510	220	295
DERAILMENTS:															
Broken rail.....	53	38	32	61	50	45	102	90	84	37	55	45	50	17	71
Loose or spread rail.....	68	44	28	42	34	81	65	69	88	72	29	21	19	20	31
Broken bridge or trestle.....	42	38	42	40	30	30	33	34	36	38	44	16	17	21	24
Broken or defective switch.....	38	33	10	29	25	7	18	9	12	3	5	8	3	1	9
Broken or defective frog.....	11	12	7	16	7	20	11	11	7	4	2	2	2	2	4
Other defects of road.....	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1
Total defects of road.....	214	167	130	184	152	174	223	182	227	156	169	89	94	73	149
Broken wheel.....	30	37	28	48	27	37	41	22	40	33	66	21	21	5	22
Broken axle.....	60	39	48	44	45	62	48	70	60	52	50	30	30	18	32
Broken truck.....	38	25	29	27	4	3	14	18	12	31	14	10	7	13	10
Failure of coupling or drawbar.....	20	7	5	7	4	3	6	3	2	2	1	1	1	2	4
Fall of brakebeam.....	27	12	9	9	10	6	10	3	2	1	1	1	1	1	3
Other defects of equipment.....	25	18	10	13	6	10	10	3	3	0	0	0	0	1	4
Total defects of equipment.....	215	159	120	148	100	122	123	67	129	102	124	64	64	41	76
Misplaced switch.....	78	64	34	70	49	68	55	82	80	90	85	80	80	48	76
Negligence of trainmen or b'gmen.....	16	10	10	4	4	1	4	2	9	2	12	4	1	5	9
Runaway engine or train.....	9	10	8	14	6	2	3	1	2	1	1	1	1	2	2
Open draw.....	3	5	1	4	6	3	6	3	4	6	2	1	1	4	4
Other negligence.....	38	22	19	26	12	12	12	2	9	1	4	6	3	6	6
Total negligence in operating.....	144	108	92	117	74	76	64	94	112	101	104	96	90	65	97
Animals on track.....	61	56	41	57	32	36	25	24	45	48	42	43	35	30	45
Snow or ice.....	6	6	5	22	6	27	30	7	13	5	15	8	22	13	20
Wash-out.....	19	18	20	19	11	23	22	25	25	23	18	17	11	36	28
Landslide.....	28	25	24	34	16	21	7	18	16	7	14	4	7	4	6
Accidental obstruction.....	30	28	8	20	31	17	17	42	53	37	45	25	24	28	38
Malicious obstruction.....	42	30	90	11	12	15	15	12	13	17	13	8	11	15	15
Switch or rail purposely misplaced.....	11	10	6	22	12	24	13	17	16	13	2	2	1	1	2
Other unforeseen obstructions.....	0	13	9	5	9	4	6	3	19	7	2	2	1	1	2
Total unforeseen obstructions.....	192	194	131	193	129	167	135	132	190	144	150	108	113	125	158
Others.....	430	377	296	386	243	102	136	186	250	238	310	237	192	175	223
Unexplained.....	430	377	296	386	243	102	136	186	250	238	310	237	192	175	223
Total derailments.....	1,301	1,004	759	1,032	703	611	681	681	926	741	857	597	557	481	709
ACCIDENTS WITHOUT COLLISION OR DERAILMENT:															
Boiler explosions.....	10	21	13	15	14	19	11	16	13	12	14	14	17	11	10
Cylinder explosions.....	12	6	3	7	2	2	2	2	1	1	1	1	1	1	3
Broken parallel or connecting rod.....	8	9	5	22	17	22	28	17	28	11	21	13	15	11	19
Cars burned while running.....	19	15	4	7	8	8	9	13	13	7	8	6	4	13	9
Various breakages of rolling stock.....	16	21	18	15	33	6	17	13	23	9	21	4	6	2	13
Other causes.....	29	20	18	33	12	12	7	4	2	2	4	4	1	1	6
Total without collision or d. f'mt.....	103	101	61	90	86	60	72	65	84	42	65	44	43	30	51

RECAPITULATION.

Collisions.....	1,137	1,041	749	804	706	501	464	445	620	561	536	437	510	220	295
Derailments.....	1,301	1,004	759	1,032	703	611	681	681	926	741	857	597	557	481	709
Other accidents.....	163	161	61	90	86	60	72	65	84	42	65	44	43	30	51
Total.....	2,441	2,116	1,509	1,926	1,495	1,172	1,217	1,191	1,646	1,384	1,438	1,078	1,110	731	1,055

* Train mileage is taken from Poor's Manual, which gives revenue mileage only; that for 1881 is estimated.
† Average per year, five years, 1873 to 1877, inclusive.

CASUALTIES TO PASSENGERS AND EMPLOYEES IN TRAIN ACCIDENTS IN 1891.

Tabulated According to Classes of Causes.

Month.	Defects of road.		Defects of equipment.		Negligence in operating.		Unforeseen obstructions and maliciousness.		Unexplained.		Total.	
	Passe.	Emp.	Passe.	Emp.	Passe.	Emp.	Passe.	Emp.	Passe.	Emp.	Passe.	Emp.
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
January.....	2	3	1	2	1	2	1	2	1	2	1	2
February.....	21	4	21	1	25	6	8	8	61	23	87	31
March.....	16	8	5	1	10	3	3	12	16	50	1	1
April.....	14	1	3	1	6	1	5	13	37	73	1	1
May.....	11	8	6	1	7	8	1	19	20	50	2	22
June.....	17	53	3	4	1	6	37	52	10	6	13	3
July.....	1	8	3	5	4	21	1	18	76	19	105	19
August.....	1	19	1	1	4	4	5	39	38	70	7	5
September.....	20	24	5	5	7	7	3	11	40	27	60	1
October.....	2	7	2	2	2	5	15	49	37	104	1	1
November.....	1	76	0	22	15	3	16	42	48	112	2	10
December.....	24	291	45	101	7	90	42	65	114	458	345	930
Year.....	19	193	61	136	4	86	30	77	115	324	337	959
Year 1890.....	16	167	30	81	7	38	24	63	46	291	189	680
Year 1889.....	7	195	45	153	16	65	35	92	92	388	217	573
Year 1888.....	139	406	48	142	11	50	39	57	48	279	215	488

* Included in unexplained.

idents during the past 10 years, as tabulated in our accounts, was as follows:

	Killed.	Injured.	Train mileage, millions.	No. persons killed per million train miles.
1891.....	806	2,812	793.9	1.015
1890.....	492	1,772	688.8	0.681
1889.....	667	2,204	644.0	0.968
1888.....	666	1,916	569.8	1.018
1887.....	416	1,409	560.2	0.739
1886.....	307	1,530	541.3	0.718
1885.....	389	1,730	538.0	0.879
1884.....	471	1,910	476.0	0.798
1883.....	390	1,588		

* Train mileage is taken from Poor's Manual, which gives revenue mileage only; that for 1891 is estimated.

The more prominent causes of collisions are shown in the following table.

CAUSES OF COLLISIONS.

	1891.	1890.	1889.	1888.	1887.	1886.	1885.
Train breaking in two.....	96	65	82	67	55	81	65
Misplaced switch.....	78	93	59	61	44	41	33
Failure to give or to observe signals.....	153	82	56	62	58	30	17
Mistake in giving or under standing orders.....	85	73	46	42	27	27	37
Miscellaneous.....	259	213	150	130	87	43	47
Total explained.....	674	568	393	360	281	232	189
Unexplained.....	463	498	354	444	419	270	275
Total.....	1,137	1,041	749	804	700	501	464

As we have heretofore stated, the number of accidents happening in the United States is now so large that we do not report the whole of them in full, though the tables and totals are made in the same manner as heretofore. That our accounts are, to a considerable extent,

gathered from the newspapers, and are, therefore, far from perfect; that the columns showing "persons injured" are unsafe ones in which to make comparisons, because of the different standards of reporting, and that for these and other reasons our totals and our deductions, while valuable for comparison, are not to be regarded as precise statistics, are, we suppose, now well known facts.

The Pig Iron and Steel Rail Production of 1891.

The production of pig iron in the United States last year was 8,270,870 gross tons. The make by half-years for 1890 and 1891 was as below:

Years.	First half.	Gross tons.	Last half.	Total.
1890.....	4,560,513		4,612,190	9,172,703
1891.....	3,368,207		4,911,763	8,279,970

The production of steel rails was 1,219,874 gross tons, as against 1,797,489 tons in 1890. In the first half of last year the make was 517,794 tons, and in the second half 702,080 tons. That is, only about 15 per cent. of the pig iron was converted into rails last year, as against about 20 per cent. the year before. In 1887 our make of pig iron was 6,417,148 tons, and of this 2,101,904 tons, or about 33 per cent., went into steel rails.

Attention was called very generally to the fact that the make of pig iron in the United States exceeded that of any other country, but it was feared during July, when the decreased production for the first half of the year was known, that we would have to take a second place this year; but all apprehensions of that kind were seen to be groundless as the monthly returns of furnace capacities came in, our make for the last half of the year having been greater than for any other whole year previous to 1886. In England, on the contrary, there was no such revival, in spite of the fact that "the London syndicate" was twisting the Scotch bears and holding Scotch warrants abnormally high during the last half of the year, and 7,250,000 tons is the general estimate for the production in Great Britain. This is about a million tons less than their production in 1889, whereas our make for the past year is 676,228 tons larger than in 1889, although it is 922,833 tons less than in 1890. From 1855 to 1875 England was making about 50 per cent. of the world's pig iron, and we were making about 12 per cent.

A summary in the *Colliery Guardian* gives the average price of Scotch pig for the five years 1870-74 as \$20.50, and for 1889-91 at \$11.71. During the first mentioned period the British make was 31,900,480 tons, and our make was 10,882,910 tons, at an average price of \$38.50. During the last two years their approximate make has been 15,154,000 tons and ours 17,482,573, or instead of making 25.4 per cent. of the total of the two countries, as in 1870-74, during 1889-91 we made fully 33 per cent., and the average price of No. 1 anthracite in this country was \$17.93. Or, in other words, the English price has fallen to 57.12 per cent. of the price in 1870, while our price has fallen to 46.65 per cent. These figures give an approximate measure of the great fall in the prices of iron and ironware all over the world.

The future of the British iron trade is clouded by fears of a short but sharp panic when "the London syndicate" settles its interest and other liabilities, which it is thought it must do soon unless there is some tangible improvement in the trade which will appreciate prices. But this improvement in England seems impossible until the commercial distrust which followed the Barings failure has given way to confidence.

Here, on the contrary, there is every reason to expect a year or more of expanding production and consumption. During the past year, universally recognized as one of contraction, our production, which was only about 10 per cent. less than that of 1890, and nine per cent. more than in 1889, was fully absorbed—the stock on hand on Dec. 31 being only 627,233 tons, as against 661,821 tons a year before. Railroad construction, which was less than for any year since 1885, probably absorbed about 450,000 tons of rails. This leaves steel enough for about 7,700 miles of renewals, or less than five per cent. of the mileage, so that possibly twice as much steel will be rolled into rails this year as last, while the general diffusion of money from the large crops and the greater readiness to invest capital in this country will probably lead to a phenomenal consumption of iron.

France since its wine production has been so greatly reduced by the phylloxera has imported great quantities of cheap wines from Spain, and in order to secure a share of this business in competition with the coasting vessels which can carry it cheaply to Certe, Marseilles, and Bordeaux, the French and Spanish railroads made joint tariffs, at much less than their ordinary, not to say their local rates. The French wine producers, who have recently secured an increase in the tariff on Spanish wines, complained bitterly of this low rate, and the French government gave notice that it must be withdrawn, and, after some delay, it was abolished Oct. 25 last. The Spanish railroads, which do not always find it easy to make both ends meet, were particularly offended by the abrogation of this special rate, which may almost destroy a most important part of their traffic; and having failed to persuade the French authorities to maintain it, they have resorted to a war of rates, not by reducing but by increasing the rates on Franco-Spanish traffic. The Spanish company which works the line

from the French border along the Mediterranean to Barcelona and Tarragona suspended all joint rates between French and Spanish stations, and all through tickets and way bills, so that everything had to be transferred at the border, save a certain coal traffic. The wine shipments over this route in 1890 amounted to 91,000 tons, all but 300 tons of which were charged by the special joint tariff. During the same year, the exports from France into Spain over the route amounted to 135,000 tons of coal and 62,000 tons of other freight, most of which was carried under special tariffs at less than the regular rates.

The Russian railroads have been accustomed to give free passes not only to their employes, but to relatives of their employes—a practice which may possibly have been heard of on this side of the Atlantic. The term "relatives," however, has been found to be extremely elastic, and recently the Great Russian company put its foot down and issued positive orders that hereafter passes will be granted to no other relatives of employes than their wives, though a trifling reduction of 70 per cent. on the prices of tickets will be made to the parents, brothers and sisters of employes and of their wives; but all aunts, cousins and stepmothers must pay full fares. If your brother receives a salary of as much as 1,500 roubles (\$750) from the company, you can get your discount only on first-class tickets; if he has from 300 to 1,500 you have second-class tickets; if less than 300 roubles, third-class tickets. This must give the railroad employe a great advantage as a suitor for one of a large family of children, especially if the boys are commercial travelers.

The Prussian Minister of Public Works has recently given instructions that hereafter on the state railroads freight engines must be made to haul all the cars they can; that is, that light freight trains shall not be run as they have been heretofore on almost all lines. In level districts the ordinary load for a standard freight locomotive is regarded as from 120 to 150 axles; that is, from 60 to 75 cars of 22,000 lbs. capacity. From the coal mines heretofore light trains have been run commonly on Sundays and Mondays, because on those days not coal enough was raised to make full trains. As a result of the new order, it is said that nearly all the coal will be shipped on five days of the week.

A committee of the Massachusetts legislature has recently held a hearing on the proposition to restrict by law the issue of free passes on railroads, which was a topic in the Governor's inaugural address, but there seems to have been very little interest taken in the subject, the attendance being small. It is said that a member of the legislature two years ago received 150 passes from a certain road at one time. Another member, in expressing his surprise at the failure of the voters to reject him, is reported to have said that he "got railroad passes for all his constituents who asked for them."

Nine or more men were killed at a street crossing in the outskirts of St. Louis on the night of Jan. 19, and a half dozen or more were injured. The accident occurred at the Sarah street crossing of the Wabash road, and the engine was running tender first. Nearly all the party, who were in a large sleigh, had been drinking, but it is claimed that the driver was sober. The night was very cold and he was heavily muffled.

The Pennsylvania limited is now hauled out of Pittsburgh westward by two engines, a mail car having been recently added to the train. It is said that the large demand for steam in the cars, for heating and other purposes, was the straw that finally broke the camel's back.

NEW PUBLICATIONS.

Journal of the Association of Engineering Societies. December, 1891.

The principal paper in this issue is by Mr. A. Gottlieb on the "Foundations and Floors for the Buildings of the World's Columbian Exposition." This paper and the discussion fill 28 pages of the magazine and treat pretty carefully the problems arising and the methods by which they were met. There is a short paper on a "New Method of Calculating Areas in Land Surveying," and considerable space is given to the continuation of the discussion of Mr. Corthell's paper on "An Improved Waterway Between the Great Lakes and the Atlantic Seaboard."

Transactions of the American Society of Mechanical Engineers. Volume XII. November, 1890. June, 1891.

It would be superfluous and would take an unwarranted amount of space to attempt to give an abridgment of the tables of contents of this volume, which contains probable 40 different papers, with discussions and minutes of proceedings. The list of illustrations alone contains 334 titles.

TRADE CATALOGUES.

Illustrated Catalogue No. 1, American Steel Wheel Co. New York.

The chief product of this company is solid steel wheels, although they make also steel drawbars, buffers and levers of the Miller type, and steel gear wheels and other special castings. The method of casting the solid

steel wheel made by this company, that is the Richards process, has been quite fully described in the *Railroad Gazette*. Among the wheels illustrated in the catalogue are a locomotive driving wheel, a 30-in., spoke, truck wheel, 33 and 36-in., plate, passenger car wheels. The company also makes wheels for street and electric railroads.

Notes on Power Plants for Electric Railways and Electric Lighting. Westinghouse, Church, Kerr & Co., New York.

This little pamphlet is of more than usual interest because of the careful description and discussion of methods. There is a brief historical preface, in which it is stated that the Westinghouse Machine Co. was the first builder of direct connected dynamos in the United States, if not in the world. There are chapters on divided versus concentrated power in railroad work, and on uniform high duty under variable load, which are well worth careful reading.

General Catalogue of Contractors' Tools and Machinery. Thomas Carlin's Sons, Allegheny, Pa.

This is a catalogue of 188 pages with an alphabetical index. It shows a great variety of machinery, including hoisting engines, derricks, crabs and all the principal apparatus used by building contractors.

Facilities for the Interchange of Traffic Under the Interstate Commerce Act.

BY LAWRENCE GODKIN.

(Continued from page 81.)

such statutes, or received with all the weight of an authority.⁴

But there are some important differences in the language of the English and American statutes, and one of these differences is pertinent here. The British statutes forbid common carriers from making undue or unreasonable preference in favor of each other or subjecting each other to undue or unreasonable prejudice or disadvantage. But the British statutes contain no absolute requirement that common carriers shall give each other equal facilities. The matter is left to the broad discretion of the Commissioners, and provided that the preference or advantage given by one common carrier to another be not undue or unreasonable, the act imposes no absolute duty that the facilities provided shall be equal. But the American statute goes further. It prohibits undue and unreasonable preference or advantage, prejudice or disadvantage, in language substantially similar to that used in the British statute, and then in addition in a separate but connected paragraph it imposes the absolute duty upon carriers of affording each other equal facilities for the interchange of traffic and forbids discrimination between connecting lines; omitting the qualifying word "unjust," which is prefixed to the word "discrimination," when it is used in the second section of the Act. This difference between the English and American acts has, however, been deprived of some of its force, for by a recent dictum of the Interstate Commerce Commission it would appear that the second paragraph of the third section will be construed as being qualified by some such words as "under substantially similar physical conditions."⁵

There are some general considerations to be borne in mind in construing any of the second, third or fourth clauses of the Interstate Commerce Act, and one of these is the weight to be attached to the consideration of public convenience. For instance, a complaint against a common carrier for violation of the duties in regard to interchange of traffic imposed by the third section of the Act, may be preferred by another common carrier, or by any other person or corporation; but in determining the question raised the tribunal has to consider the convenience of the public as well as the grievance or defence of the immediate parties to the proceeding. It has been repeatedly held in England that their Railway and Canal Traffic and Regulation of Railways Acts were passed for the public benefit and not for the benefit of individuals. And Lord Chief Justice Cockburn stated the rule to be that to justify a party in calling upon the Court to enforce the provision of the Act, it was not indispensably necessary to show a case of individual grievance, but that a case of public inconvenience must be made out.⁶ And by the Regulation of Railways Act of 1888 (51 and 52 Vict., c. 25) it is provided that any of an enumerated list of authorities, including any association of traders or freighters, or chambers of commerce or agriculture, etc., may complain to the Railway Commission "without proof that such authority is aggrieved by the matter complained of" (Sec. 7).

Our Interstate Commerce Act contains an analogous provision in the fifteenth section, where it is provided that where a complaint is made to the Commission of a violation of the Act, or of any law cognizable by the Commission, "or that any injury or damage has been sustained by the party or parties complaining, or by

other parties aggrieved in consequence of any such violation," the Commission may act.

The cases cited show the paramount importance which the English tribunals have attached to the necessity of the public convenience being affected in order to invoke their powers under the Railway & Canal Traffic and Regulation of Railway Acts. The Interstate Commerce Commission has not yet had occasion to utter any decision holding the necessity of the existence of a public inconvenience to move it to redress an individual or corporate grievance, but it has declared that the part of the third section of the Act which relates to interchange of traffic was intended "for the public benefit more particularly than for the benefit of the carriers themselves."⁷

Leaving this, however, and coming to the question of what carriers are subject to the third section of the Act, we find that by its terms it is made applicable to "every common carrier subject to the provisions of this Act," i. e., to every common carrier engaged in interstate commerce. It is not proposed to discuss here what constitutes interstate commerce within the meaning of the Act. But as in every interchange of traffic there must be two or more carriers engaged, a few principles of jurisdiction have been established which relate particularly to the relations of carriers in the interchange of traffic under the third section. As, for instance, where the question as to facilities for the interchange of traffic arises between a common carrier engaged in interstate commerce and a common carrier not engaged in interstate commerce, the Interstate Commerce Commission has held that the section does not apply, for the reason that the duties and obligations sought to be imposed upon the carrier in such case cannot be made reciprocal. "In the absence of express language to that effect, it cannot be inferred that Congress intended to require a common carrier engaged in interstate commerce to extend the valuable aid and facilities enumerated in this clause to another common carrier, operating a connecting line, which is not subject to the provisions of the Statute, and which cannot be required to make any return whatever on its part in the shape of similar services and facilities to the interstate carrier from which it has received these benefits."⁸

If, however, the Commission were to apply the English view that the statute was passed for the benefit of the public and that the public convenience is the paramount consideration, the reasoning above quoted would lose much of its force. In a previous decision the Interstate Commerce Commission, while denying its authority to compel a rail carrier subject to its jurisdiction to make a joint through rate with an independent carrier by water, uttered a dictum to the effect that such rail carrier could not decline to receive from or deliver freight to connecting water lines.⁹ And yet there may be just as great a lack of reciprocity in the latter case as in the former, for there is nothing at common law to compel a carrier by water, which is not within the jurisdiction of the Interstate Commerce Act, to receive from or deliver freight to a connecting rail line.¹⁰ And inasmuch as the act directs common carriers to afford "all reasonable, proper and equal facilities for the interchange of traffic," etc., if the public convenience demands a through rate, and this consideration is of paramount importance, it would not seem to be an answer to say that the water carrier cannot be compelled to reciprocate. As far as the public convenience is concerned, half a loaf is better than no bread, and the fact that the public cannot have through rates in both directions is no good reason why it should not have them in one direction. However, as far as through rates are concerned, there is another and stronger reason why the Interstate Commerce Commission cannot compel the establishment of through rates; and this reason applies whether both the carriers or only one of them is within the jurisdiction of the Act. But this reason will be considered later.

In the Capehart case, above cited, it was also held that the third section of the Act did not apply to the case of a carrier entirely by water, for the reason that the use of the words "tracks and terminal facilities" precluded by implication the application of the section to any but an all rail carrier or a carrier part rail and part water.¹¹

A similar exception of carriers by water from the operation of the Railway & Canal Traffic Act of 1854 was made by the English Railway Commissioners, though for different reasons. It was sought to compel a railway line terminating at the sea to make the same arrangement with one steamboat owner for carrying its goods and passengers across the sea as it had made with another steamboat owner; but the petition was refused, the Commission saying in substance that the railway had a right to use its discretion and prefer one vessel to another, "a safe to an unsafe vessel, or responsible owner to limited liability company or men of straw."¹²

A contrary view, however, of the right to discriminate between steamers was taken by the United States Cir-

⁴ McDonald vs. Hovey, 110 U. S. 619.

⁵ New York & Northern R. R. Co. vs. N. Y. & N. E. R. R. Co. et al., 4 I. C. C. 720, 721.

⁶ Beadell v. Eastern Counties R. Co., 1 Railway & Canal Traffic Cases, 56.

⁷ Caterham R. Co. v. London, Brighton & South Coast R. Co., Ditto, 35.

⁸ Palmer v. London, Brighton, etc., R. Co., Ditto, 271.

⁹ Painter v. London, Brighton, etc., R. Co., Ditto, 38.

¹⁰ Barrett v. Gt. Northern & Midland R. Co's., 1 Railway & Canal Traffic Cases, 43.

¹¹ In re Chicago, St. P. & Kansas City Ry. Co., 2 C. C. R. I. 259.

¹² Capehart v. Louisville & N. R. Co. et al., 4 I. C. C. R., 245, 274.

¹³ In the Matter of Joint Water and Rail Lines, 2 I. C. C. R., 645, 647.

¹⁴ Atchison, Topeka & Santa Fe R. T. Co. v. Denver & New Orleans R. R. Co., 110 U. S., 697.

¹⁵ Capehart v. Louisville & N. R. Co., 4 I. C. C. R., 265, 274.

¹⁶ Napier v. Glasgow & Southwestern Ry. Co., 1 Railway & C. T. Cases, 232, 304.

cult Court of Alabama, and its decision apparently approved by the Interstate Commerce Commissioners.¹³

The Interstate Commerce Commission has also expressed its opinion that express companies organized and operated independent of railroads are not subject to its jurisdiction.¹⁴

Coming now to the question of what are the "facilities" which must be reasonable, proper and equal, and accepting the ordinary definition of the word, to wit, the means by which the performance of a thing is rendered more easy, it is evident that the word in its application to interchange of traffic may mean a number of different things. It includes actual physical facilities for transferring traffic from one railroad to another, station accommodations and the like, convenient arrangements for taking over traffic, good service on the railroad of the transferee of the traffic, such as sufficient and proper cars and convenient trains. It also includes facilities of a different nature, such as through bills of lading for freight or through tickets for passengers and through rates. The qualifying and limiting clause "according to their respective powers" which is contained in the section under discussion is copied from the English statute. The powers referred to are the powers which the common carrier derives from its charter or act of incorporation.¹⁵

The carrier's charter is of course the measure of its powers, and it could not be compelled to afford facilities which would be *ultra vires*. The English Railway & Canal Traffic Act of 1854 provides that in the construction of that act the word "railway" shall include stations. This would seem to be rather an unnecessary definition, and there can be no doubt that under our act the word would be held to include stations. But after the most elaborate consideration which has yet been given to the meaning of the word "facilities," the Court of Appeal in England held that this definition only included existing stations, but while there was no power in the Railway Commissioners to order a railway to make a new station, it was within their power to make an order for facilities which would necessitate the making by the company of structural alterations to existing stations.¹⁶ This might appear to be rather a fine distinction; but, be that as it may, it would seem to be the law under our act as well as under the English statutes, that the Commissioners have no power to compel a railway company to establish a new station yard depot in a new place. As expressed by Judge Jackson in the Kentucky and Indiana bridge case, the act to regulate commerce deals with common carriers as it finds them, and leaves to them full discretion as to what extensions they will make of their lines, the connections they may form and the yards and depots they may choose to establish. They are not compelled to make new station yards or depots, even though such additional construction might be for the convenience of the public or of other carriers (37 Fed. Rep., p. 64).

It sometimes happens in respect to interchange of traffic that the interchanging carriers are not able to agree as to the arrangement which shall be made between themselves for the interchange. In such case the interesting question arises whether they can be compelled to come to an agreement. The English Railway Commissioners have twice held that they could be.¹⁷ But the Exchequer Division of the High Court of Justice held otherwise, and restrained by writ of prohibition the order granted by the Commissioners in the case last cited.¹⁸ And Baron Cleasby laid down the proposition that the Commissioners had no power to compel two railway companies to act jointly in doing what neither company has power to do separately. One of the things which it was sought to compel the companies to do in this case was to interchange traffic at a junction. If this decision of Baron Cleasby is sound it will at once be seen how it weakens the provisions of the Act in respect to compelling facilities for the interchange of traffic. A similar difficulty, as will be shown hereafter, arises under the Interstate Commerce Act in regard to compelling facilities by through rates.

In respect to the power of one carrier to compel another to furnish proper and convenient service for the interchange of traffic under the English decisions, it is a question of whether or not the existing service meets the fair requirements of the public.¹⁹ Here, again, we have an illustration of the importance in the eyes of the English tribunals having jurisdiction of the regulation of railways of the consideration of public convenience. In general, it may be said that everything is a "facility" which tends to render more expeditious and easy the transfer of traffic from the point of shipment to the point of destination, and, subject to the exceptions which have been alluded to, one carrier may require

from another all facilities for the interchange of traffic which are in the railroad's powers, which do not demand the construction of new station yards, depots or railroads, and which are demanded by the public convenience.

When, however, we come to the question of facilities by through billing and through rates, we are met with two difficulties under the American statute. Of these, one arises from the failure of the Interstate Commerce Act to provide the machinery for establishing a through rate where the carriers are unable to agree upon its terms, and the other from the want of jurisdiction of the commission over intrastate carriers. The English Regulation of Railways Act of 1873 (section 11) after declaring that the word facilities shall include the forwarding of through traffic at through rates, provides that if the company requiring the traffic to be forwarded and the forwarding companies cannot agree upon the rate or the route, and the forwarding companies object to the rate or route proposed "the commissioners shall consider whether the granting of the rate is a due and reasonable facility, in the interest of the public, and whether, having regard to the circumstances the route proposed is a reasonable route, and shall allow or refuse the rate accordingly." The right to apply for through rates under this section is not confined to the companies owning lines at the two ends of the through rate, but extends to an intermediate company and to steamship companies.²⁰ But there is no similar or analogous provision in the Interstate Commerce Act, and where one of two or more interchanging carriers declines to establish through rates with the others, the Interstate Commerce Commission has held that it has no power to compel the establishment of such rate because it has no power to itself determine and apportion the rate.²¹ But in the case of the New York & Northern R. R. Co. vs. New York & New England R. R. Co. et al. the Interstate Commerce Commission held that where a carrier had once established a through rate with a forwarding carrier, which rate was reasonable and satisfactory to both railroads, it could not discontinue this through rate with that carrier and establish it with another forwarding carrier operating an alternative route to the same point of destination, for that would constitute a case of unjust discrimination and a refusal of equal facilities which the Commission has power to forbid.²²

To put it briefly, as the law at present stands it would seem that an interstate carrier may refuse to establish a through rate; but once established, it cannot discontinue the rate with one carrier and give it to another. The Interstate Commerce Commission has several times called attention to its want of power to compel interstate carriers to give through rates, and has recommended that the Interstate Commerce Act be amended in this regard.²³

The other difficulty in the way of the establishment of through rates and routes is the result of the limitation of the Interstate Commerce Commission's jurisdiction to carriers engaged in interstate commerce. It has been claimed that this enables state roads to refuse to join with interstate roads in making through rates and routes. In its last annual report, however, the Commission has expressed the opinion that whenever the state road gives, receives or acts upon through shipping bills or carrier traffic whose destination is distinctly made known to be a point beyond the state boundary, such state road becomes subject to the jurisdiction of the Interstate Act, and this is probably the law.²⁴

The object of the interchange of traffic clause of the Interstate Commerce Act was to prevent carriers from imposing upon the public the burden of the loss and inconvenience resulting from the carrier's own rivalries and contentions. And from an examination of the law as it at present stands, it will be seen that in so far as the Act has fallen short of accomplishing this object, its failure is due to the omission to include within its jurisdiction carriers entirely by water, and the omission to give the Commission the necessary authority to make arrangements between the carriers for the interchange of traffic, when they are unable to agree upon the terms of such arrangements among themselves. Nor does there seem to be any good reason why the Third section should not be amended to remedy these omissions. For, whatever difference of opinion there may be in regard to the desirability of the clauses of the Act prohibiting pooling and regulating charges for long and short hauls, there can be little question in regard to the salutary operation of the clauses designed to facilitate the interchange of traffic and prevent discrimination by carriers against each other.

TECHNICAL.

Manufacturing and Business.

The Wehn Pavement Co., of 16 Exchange Place, New York, has been laying lithogen pavements for platforms during the past year for the Louisville & Nashville, the Cleveland, Columbus & Akron, the N. Y. C. & H. R., and N. Y., N. H. & H. railroads. This work includes depots at Louisville, Akron, New York and Fordham, N. Y. At the latter place about 14,000 sq. ft. of platform was laid, the material being stained to a slate color. Here there was a curb 30 in. high which was quite difficult to lay owing to the platform not being much lower than the station, and also from the fact that there was a curve at this point to which the platform must conform.

G. W. Cushing, formerly Superintendent of Motive Power of the Northern Pacific, the Philadelphia & Reading and the Union Pacific, has been elected General Superintendent of the American Steel Wheel Co., in charge of the mechanical department of the company at South Boston and of the new works to be erected in New Jersey. His office will be at South Boston, Mass.

Testing Air Brakes.

A rule has been adopted on the Southern Pacific in Texas requiring enginemen, both passenger and freight, to make a trial application of the air brakes after starting the train and before attaining a speed of more than six miles an hour. This is to be done at the beginning of the trip and whenever a car has been taken or left.

Steel Tired Car Wheels.

The Master Car Builders' Association issues a circular on steel tired car wheels as follows: "The committee on steel tired car wheels requests you to furnish them the information on the subject indicated on enclosed blank form. It is desirable for this to cover all steel tired wheels which are now or have been in service under your car equipment. The return of this form, with information filled in, by March 1, will be appreciated by the committee. Address reply to: R. E. Marshall, Superintendent Motive Power, P. W. & B. R. R., Broad street station, Philadelphia." The questions on the blank are as to: Name of Wheel; Maker; Diameter, New, and Minimum allowed at Last Turning; Number in Service; Type of Centre, Cast, Wrought, Steel or Bolted; Defects, Character of, and Approximate Mileage Made Before Developed.

New Steamers for the Stonington Line.

A new Sound steamer, the "New Hampshire," for the Stonington Line, was launched at the yards of Harlan & Hollingsworth on Jan. 16 last. A sister ship, the "Maine," for the same company, was launched last October. The two vessels are built and are to be fitted up exactly alike. The hulls are divided into seven watertight compartments and their general dimensions are 302 ft. 7 in. length at water line; 310 ft. length over all; 44 ft. breadth of beam at load water line; 60 ft. width over guards; draft, 12 ft. 6 in. The engines are of the inverted, direct acting, triple expansion type with surface condensers attached. The cylinders are four in number, one of 28 in. diameter, one of 45 in. diameter and two of 51 in. diameter. The stroke is 42 in. The propeller is of cast iron, 13 ft. 6 in. in diameter, four-bladed and left handed.

The boilers are four in number of the Scotch type, each 13 ft. 6 in. in diameter and 11 ft. 6 in. long. They are of steel with a tensile strength of 60,000 lbs. to the square inch and have three furnaces each of the corrugated type. The diameter of furnaces is 46 in., the length of grate 6 ft. The steam pressure to be carried is 100 pounds to the square inch. They are to be fitted to be operated either with forced or ordinary draft.

The rudder will be operated by the Williamson combined hand and steam steering gear. Both vessels are expected to be ready for service by May next in time for regular summer service.

Car Lighting.

A contract for 120 passenger coaches just let by the Chicago & Northwestern and the "Omaha" roads specifies that they shall be equipped with Pintsch gas. The material for this equipment will be delivered as rapidly as necessary, the delivery of the cars to begin next August.

The Armor-Plate Test Completed.

The last two armor plates of the eight ordered for competition were tested at the Indian Head proving grounds on Wednesday, the 13th of the present month. They were furnished by Carnegie, Phipps & Co. Unfortunately both plates were imperfect; one, a low carbon alloy steel plate was warped in the tempering and afterward planed down to a level backing, leaving it thinner in some portions than in others, the thickness varying between 9 and 10.5 in. A second plate of high carbon nickel steel cracked at one end under treatment and was reduced some 20 in. in its length. Both plates were Harvey treated, and on account of the reduction in area of the second plate, it was only subjected to four instead of the usual five shots. The latter plate being of smaller area than the other was subject to harsher treatment owing to the closeness of the shots to each other. These shots were fired in a triangular shape, and the fourth or final 8-inch shot was fired at the centre of the triangle. The 8-inch projectile passed through both plate and backing and penetrated deep into the sand beyond. Cracks separated the plate into three pieces, each piece

¹³ *Samuels vs. Louisville & N. R. R. Co.*, 31 Fed. Rep., 57. *N. Y. & Northern Ry. Co. vs. N. Y. & N. E. R. R. Co.* 4 I. C. C. R., 718, 719.

¹⁴ First Annual Report, I. C. C. R., 273-277.

¹⁵ Second Annual Report, I. C. C. R., 402-404.

¹⁶ *Tharles Sulphur Co. v. London, etc.*, R. Co., 3 R. & C. Traffic Cases, 455.

¹⁷ *Southeastern R. Co. v. Ry. Commissioners and Corporation of Hastings*, 3 Ry. & C. Traffic Cases, 464.

¹⁸ *Victoria Coal & Iron Co. vs. Neath & Brecon R. Co.*, et al., 3 R. & C. Traffic Cases, 37.

¹⁹ *Toomer vs. London, Chatham, etc.*, Ry. Co. et al., 3 R. & C. Traffic Cases, 74.

²⁰ *Toomer vs. London, Chatham, etc.*, Ry. Co. et al., 3 R. & C. Traffic Cases, 99.

²¹ *Caterham Ry. Co. vs. London, etc.*, Ry. Co., 1 C. B. (N. S.), 410.

²² *Central Water & Carmarthen Ry. Co. vs. Great Western Ry. Co.*, 2 R. & C. Traffic Cases, 191.

²³ *Greenock & Wemyss Bay Ry. Co. vs. Caledonian Ry. Co.*, 2 R. & C. Traffic Cases, 227.

²⁴ *Central Water & Carmarthen Junction Ry. Co. et al. vs. Great Western Ry. Co. et al.*, 4 R. & C. Traffic Cases, 116.

²⁵ *Little Rock, etc.*, R. Co. vs. East Tennessee, etc., R. Co., 3 I. C. C. Rep., 1.

²⁶ *Mattingsly vs. Penn. Co.*, 3 I. C. C. Rep., 592.

²⁷ *Lehmann Higginson & Co. vs. S. Pacific Co.*, 4 I. C. C. Rep., 1.

²⁸ *N. Y. & Northern R. Co. vs. N. Y. & New England R. Co.*, 4 I. C. C. Rep., 702.

²⁹ *Little Rock & Memphis R. Co. vs. East Tennessee, etc., Co.*, 3 I. C. C. Rep., 1.

³⁰ Third An. Rep. Interstate Com. Commission, 3 I. C. C. Rep., 432.

³¹ Fourth Annual Rep., 4 I. C. C. R., 400.

³² *Baird vs. St. Louis I. N. & S. Ry. Co.*, 41 Fed. Rep., 362.

having a portion of two of the outer holes and a one-third share of the centre hole. The central 8-inch shot penetrated the low carbon all steel plate and its backing, leaving prominent cracks connecting the holes of the first, fifth and fourth shots. The only injury to the backing of the high carbon nickel steel plate was that due to the fourth or 8-inch shot as described.

The results of the trial of the two plates was quite favorable to the high carbon nickel steel plate, and as a result of the whole series of plate trials, it would appear that a high carbon nickel steel Harvey treated plate is the best for armor purposes. Improvement in the plates is expected with increased experience in the application of the Harvey treatment and in the tempering.

Delicate Chronographs.

At a recent meeting of the French Physical Society, Mr. W. Schmidt described several forms of chronographs capable of measuring down to the ten-thousandth part of a second. These devices have been applied, with good results, to the measurement of the initial velocities of projectiles, and also to the time occupied by bodies falling through short distances.

New Ore Dock at Two Harbors.

The Duluth & Iron Range Railroad has received a large number of bids for building its new ore dock at Two Harbors, Minn. It will be 400 ft. long, and will increase the dock shipping capacity of the road to about 1,300,000 tons of ore a year. It will be 51½ ft. high and will cost about \$175,000.

Ferry-Boats For Sale.

The Grand Trunk Railroad has advertised for bids for the purchase of one or both of the ferry-boats, "Huron," and "International," now lying at Point Edward, Ont., formerly used for transferring cars between Point Edward, Ont., and Fort Gratiot, Mich. The dimensions of the boats are as follows: "Huron"—Length of hull, 235 ft.; length over all, 250 ft.; depth, 15 ft. The cylinders are 30 x 30, and boilers of locomotive type with high pressure engine. "International"—Length of hull, 220 ft.; length over all, 226 ft.; depth, 15 ft., with engines and boilers similar to the "Huron." The boats have three tracks, and carry 18 cars each.

Automatic Block Signals.

The Westinghouse automatic electro-pneumatic block signal system now in use on the four-track line of the Central of New Jersey between Jersey City and Newark Bay, 10 miles, is to be extended to Bound Brook, 31 miles from Jersey City, the contract having already been given out. This will complete the equipment of that portion of the road used by the fast trains between New York and Philadelphia. The pile bridge across Newark Bay, which is about two miles long, will be equipped with a large number of signals, so as to make very short block sections. From the west end of the bridge to Bound Brook the sections will be about 3,000 ft. long.

Electric Drilling in the Bed of the Mississippi.

Undoubtedly the rock drilling that has been done by electricity in the bed of the Mississippi River, between Rock Island and Moline, Ill., signalizes the completion of the largest contract of the kind thus far undertaken. The electric drilling at Rock Island was done under the terms of a contract made with the Government of the United States by the Thomson-Van Depoele Electric Mining Co. The Government, which owns Rock Island, has for some time been engaged in the work of deepening a portion of the southern channel of the Mississippi. This is done with the two-fold purpose of securing a more plentiful supply of water power, which is used at the shops on the island, and to provide a navigable channel at Moline.

A coffer-dam was erected at the head of the island at a cost of about \$25,000, and the Government is now deepening a channel 400 ft. wide to the extent of 4 ft. The particular portion of the work on which electricity was employed is a strip of limestone 600 ft. long, with an average width of 50 ft. The remainder of the rock is a much softer sandstone, and can be profitably drilled by hand. It has been shown, however, that electric power only costs about half as much as hand drilling in the harder rock. Nine drills were used on the work. Eight of these were mounted on weighted tripods in the usual manner, while one, somewhat larger in size, was mounted on a carriage and wheeled about on a temporary track. The machines used were the regular Van Depoele reciprocating drills.

The current was obtained from a plant near the pumping station, the 25 H. P. engine of this latter being used. The generating plant consisted of dynamos 20 and 10 kilowatts capacity.

As to the practical and commercial results of the operation of these drills. The contract required that as many holes as were necessary should be drilled in the limestone rock to a uniform depth of 4 ft. The holes were made 1½ in. in diameter at the top and 1¼ in. at the bottom, drills of three different lengths being used. Work was begun on Oct. 23, and on Dec. 10, 941 holes had been drilled, many of them exceeding by 2 or 3 in. the specified depth. This represented 3,764 ft. of drilling. The whole number of nine drills was not employed until the latter period of the work, however, and a carefully kept record showed that at the date mentioned the work had taken 1,083 drill hours. This gives an average of 3.6 ft. per hour for each drill.—*Western Electrician.*

THE SCRAP HEAP.

Notes.

A Pittsburgh paper says that about 11,000 loaded cars now pass Altoona eastward weekly.

The Atchison, Topeka & Santa Fe is equipping a local passenger train with electric lighting apparatus.

The New York, New London & Norwich Transportation Co. was chartered at Portland, Me., last week. The capital stock is \$800,000.

There was a small strike of yardmen on the Louisville, St. Louis & Texas, at Louisville, Ky., last week, accompanied by some violence.

The *Railway News Reporter*, of Omaha, printed a bold day number of 56 pages, mostly filled with portraits and sketches of railroad men.

The strikers on the San Antonio & Aransas Pass road have admitted their defeat. They received no support from any of the large brotherhoods.

Senator Gallinger, of New Hampshire, has introduced a bill in Congress to allow the granting of passes to newspapers for advertisements and "other services."

On the morning of Jan. 21 the shops of the New Orleans & Southern at Poydras, La., were burned, together with 6 passenger and 3 freight cars. Total loss \$65,000.

A bill has been introduced in the Ohio legislature providing for the appointment of an "Examiner of Railroad Telegraphers" with a salary of \$1,300, to see that none but competent persons are employed as operators.

A freight conductor of the Elgin, Joliet & Eastern road, who was injured by falling when he grasped for a hand-rail which was defective from damage done to it in a collision some time before, has secured a verdict against the road for \$15,000 damages, after five trials.

The "Veterans' Association of the Employees of the Pittsburgh Division of the Pennsylvania Railroad," has been organized at Pittsburgh, with Robert Pitcairn, Division Superintendent, as President. The qualification for membership is either 21 years' service on the division or service upon it prior to April 1, 1865.

The Boston & Maine and Old Colony roads have recently taken out policies of insurance to cover their personal damage losses by accidents, and a Boston reporter bears that they paid \$250,000 premium. Whether this is for one or both roads and whether it is for one year or for some other time is not stated.

Spanish American Notes.

The Mogiana Railway Co., of Brazil, has petitioned for a concession to extend this line to Santos, agreeing to build a double track from Santos to Campinas. This road is owned and operated entirely by Brazilians, and now runs from a point west of the city of Sao Paulo something over 250 miles to Ribeiro Preto. It is one of the few roads in Brazil which has proved profitable.

The Talca Railway Co., Chili, reports earnings during the past year of \$76,000, upon 18 miles of road. Reduction in traffic during the civil war was 75 per cent. from the previous year. No dividend has been declared.

Gross receipts from the Peruvian corporation's lines of railroad for December last amounted to \$175,330, as against \$128,800 for the same month in 1890. The increase in receipts since July 1, 1891, over those for the same period in 1890 has been \$267,350.

President Flores, of Ecuador, has issued a decree providing for the payment, after June 1, 1892, of 10 per cent. of the customs receipts from import duties to the representative of the foreign bondholders. This completes the transaction recently made with the government whereby the bondholders are to accept new issues of bonds, representing a face value considerably reduced from that of the original bonds, together with bonds on the government railroads. Although the creditors must pocket a large loss under this arrangement, the result is nevertheless much better than was anticipated several years ago. Under the circumstances, with the government's available resources strained to the utmost to pay interest upon a large national debt, and upon railroad bonds as well, we may be sure that future railroad building in Ecuador will not be undertaken for merely speculative purposes.

To be a foreign bondholder in Spanish America seems to mean to fall heir ultimately to the railroads of the country. This happened in Peru and has in effect taken place in Ecuador. Now Honduras has undertaken the discharge of her indebtedness in a similar manner. A corporation has been formed by the bondholders, to which the government has ceded immense areas of the richest public lands, together with control of the railroad to the capital, which, according to the terms of the contract, is to be completed by the corporation. The amount of indebtedness which the government wipes out in this manner is \$28,027,000, a large part of which was nominally bearing 10 per cent. interest.

Advices from Honda, Colombia, state that severe floods in that region have swept away bridges on the Dorado and Girardot railroads. The interior of Colombia has suffered considerably during the past season both from excessive rains and from devastation by locusts.

English journals have recently been quoting some remarks of Chas. R. Flint intended to show the present dependence of America upon British banks to effect clearances in our South American trade. The fact is indisputable, and should stimulate our people to alter it. Our facilities are deplorably inadequate for the increase of Southern trade, in many cases the freight rates from New York to Caribbean ports being exactly twice as great as from Liverpool to the same points.

A board of railroad statistics has been created by a decree of the Argentine Minister of the Interior, the object being to obtain data on the basis of which railroad legislation may be intelligently guided.

An amalgamation of the Central Argentine and the Buenos Ayres & Rosario railways is being seriously considered. The former extends from Rosario to Cordoba, with several branches in the state of that name, practically paralleled by the main line and branches of the latter. It is estimated that the receipts of these two roads would be increased \$500,000 per annum by such a combination. The Central Argentine has probably the most to gain by this transaction, since it has suffered not alone by the competition of the Buenos Ayres & Rosario Railway but by the loss of traffic from Cordoba since the completion of the narrow gauge Rosario & Cordoba Railway, which has amal-

gamated with the Central Northern Railway, affording a continuous route of one gauge from near the Bolivian frontier to the port of Rosario.

Difference of gauge on connecting railroads is becoming a serious trouble in Argentine, and, strange to say, no greater wisdom appears to rule in projects for the future. It may not be generally known that the transcontinental line from Buenos Ayres to Valparaiso, now nearing completion, will be afflicted with this same evil, having a 5 ft. 6 in. gauge to Mendoza, on the Argentine side, and a 4 ft. 8½ in. gauge to Santa Rosa, on the Chilean portion.

The Tres Arroyos-Bahia Blanca branch of the Buenos Ayres Great Southern Railway, 120 miles in length, was opened to traffic last month. Work was begun in November, 1890, and a force of 2,500 laborers has been employed in construction. The cuts on the line amounted to 2,340,000 cu. yds., and two viaducts and 52 bridges had to be built. The track was laid with 70-lb. rails. The cost of this road was \$4,607,875, or about \$38,400 a mile.

The gross receipts of the Antofagasta & Bolivia Railway for the year just ended were \$2,840,000, an increase of nearly 16 per cent. over those of 1890, in spite of the Chilean revolution. There are at present 379 miles on this route open to traffic.

The Alagoas Railway Co., of Brazil, opened its new branch to Assembleia on Dec. 24, 1891. The concession for this branch, 40 miles in length, was granted in 1885. The actual work of construction occupied 28 months, less than was required by the contract with the Government. The main line of the Alagoas Railway extends from Maceio, the capital of the state of Alagoas, northwest along the valley of the Rio Mundaú to the town of Imperatriz, a distance of 55 miles.

It is announced that Messrs. G. Amsinck & Co., of New York, have extended their banking facilities in Colombia, so that drafts upon New York may now be purchased in all the important towns of that republic. These conveniences should facilitate our trade considerably with Colombia.

James Orr, Chief Engineer of the Cauca Railway, an American enterprise intended to connect Buenaventura, Colombia, with Cali and the Valley of the Rio Cauca, was drowned a few days ago in the floods on the Rio Chantadura.

Traffic in the Fourth Avenue Tunnel.

General Manager Platt of the "Harlem line," which includes that portion of the New York Central & Hudson River road from Forty-second street to 149th street, New York City, has just made his annual report. The average number of trains per day last year (including Sundays) was 411. The greatest number of trains in any one day was 532, and they included 2,302 cars. The increase in the number of each day over 1890 was 59. An average of 65 trains in each direction stop at Mott Haven (138th street) Station daily, and, in the language of the report, "these stops with the drawbridge openings close the line three hours a day." Changes of track are in progress at Forty-ninth street, which will afford easier access to the west yard and increase the switching facilities now overcrowded at that point. New signals for the tunnel, retaining the safeguards of the track circuit and the absolute block, at the same time overcoming the delays inseparable from them, have been devised, officially approved by the Railroad Commissioners, contracted for, and are now under construction. The drawbridge over the Harlem River was opened 11,438 times last year, an average of about 31 times each day.

The National Board of Trade.

The National Board of Trade held its twenty-second annual meeting in Washington this week. The subjects considered were: The question of permanence in the statistical work of the Government, uniformity of commercial laws, improvement of public highways, the Torrey Bankruptcy Bill, amendments to the Interstate Commerce Act, uniform bills of lading, rolling stock used for storage purposes, extension of trade relations, regulation of immigration, improvements of the Great Lakes and the Mississippi River, the enlargement and maintenance of the Erie Canal by the general government, silver legislation, National banking laws, an anti-adulteration law, insurance, letter postage, cheap telegraphy, a permanent census office and the Presidential term.

The Canals of New York.

Superintendent Hannon, of the State Department of Public Works, in his annual report for the fiscal year ending Sept. 30, 1891, emphasizes State Engineer Hoggart's observations concerning the dangerous condition of the aqueducts on the Erie Canal, stating that the only obstruction to navigation during the year have been through their partial failures. The expense of operating the State system of canals, with ordinary repairs, has been \$747,079.43. Much of the work covered by special appropriations is computed, and the remainder is progressing as fast as practicable. A further appropriation of \$15,000 for the completion of the Forrest Port dam is called for.

The whole number of tons of freight carried upon the canals of the state during the season of navigation was 4,563,472, and was composed of the following described class of articles: Products of the forests, 1,206,986; agriculture, 1,171,192; manufactures, 109,387; merchandise, 250,083; other articles, 1,825,824. Of the total amount of freight moved, 3,190,331 tons were carried east and 1,373,141 tons were carried west; and of this amount 2,651,838 tons were through freight and 1,911,634 tons were way freight. Comparing the tonnage of 1891 with that of 1890, there is shown to be a loss of 682,630 tons, but during the year 1890 much ice was transported upon the canal, so that the loss last year, as compared with the tonnage of last year (exclusive of the ice), is 215,003 tons.

Mr. Hannon says that the present system of lengthening locks is insufficient as a mode of increasing the usefulness of the canals, and that future improvements should be made with a view to enabling boats with much larger cargoes to be navigated upon them, and with a further view to a more rapid delivery of cargoes between the points of production and consumption, which also involves an increase in the motive power for the propulsion of boats over that which is now used upon the canals.

The only profits made by carriers on the canals has been made by those of them that operated steam canal-boats. Of these 60 were employed last season.

Two Passenger Classes Instead of Three.

The managers of the Cheshire and the Manchester, Sheffield & Lincolnshire Joint Railroad System, from Manchester, Eng., to Hawarden, and to Wrexham via Chester, in accordance with notice, have discontinued

the issue of second class tickets. The order came into force Jan. 1, when the carriages used for the second class were utilized for the better accommodation of third class passengers. Persons who may hold unexpired second class season or contract tickets will be allowed to occupy first class carriages. No reduction has been made in the fares at present for first class tickets.

Securities listed at the New York Stock Exchange.

The Governing Committee of the New York Stock Exchange has added to the lists for dealings new securities, as follows:

Chicago, Peoria & St. Louis.—\$1,041,000 first consolidated mortgage five per cent gold bonds of 1939.

Louisville, New Albany & Chicago.—\$3,200,000 additional capital stock, making the total amount listed \$9,600,000.

Louisville & Nashville.—\$500,000 additional unified 50-year four per cent. gold coupon and registered bonds, making the total amount listed \$7,750,000.

Milwaukee, Lake Shore & Western.—\$375,000 additional extension and improvement five per cent. gold sinking fund bonds, making the total amount listed \$4,104,000.

Northern Pacific Terminal Co. of Oregon.—\$600,000 additional first mortgages six per cent. gold bonds, making the total amount listed \$3,600,000.

Norfolk & Western.—\$7,050,000 Maryland and Washington division first five per cent. gold bonds.

Rome, Watertown & Ogdensburg.—\$300,000 additional capital stock, making the total amount listed \$7,908,100.

Savannah, Americus & Montgomery.—\$2,500,000 first mortgage six per cent. 30-year gold bonds of 1919.

West Virginia Central & Pittsburgh.—\$300,000 additional first mortgage six per cent. gold bonds, making the total amount listed \$2,300,000.

Wheeling & Lake Erie.—\$1,000,000 additional common capital stock, making the total amount listed \$6,000,000.

Maine Railroad Commissioners' Report.

A summary of the 33d annual report of the Railroad Commissioners of Maine has been published. By an amendment of the law the returns of corporations close June 30, instead of Sept. 30, as heretofore. The total length of steam railroads June 30, 1891, is 1,382.47 miles. The gross transportation earnings for the year were \$7,012,778. Total number of passengers carried, 5,502,646. Tons of freight carried, 10,389,420. The annual examinations showed a continued improvement in roads, rolling stock, bridges and buildings, and certificates giving the condition of all railroads were sent to each corporation as required by law.

The Board has granted approval of certain heaters for cars, but has notified all roads that after June 30 next no method of heating will be approved which does not reduce the danger by fire to a minimum.

"During the past session of the Legislature, but little legislation respecting railroads was enacted. The spirit of animosity to railroad corporations and their management which prevails among the people of the South and West, and which has culminated in the enactment of the Interstate Commerce Law, and much adverse legislation in several states, has not, to much extent, prevailed in Maine."

Several attempts to secure legislation, controlling rates and traffic, were made, "none of which, however, have received favorable consideration by the law-making power." Since the enactment of the law in 1876, giving the Commissioners power to revise and establish rates, "we are pleased to state that the railroads have been operated in such manner that no complaint has yet been made to this Board that tolls or charges were unreasonably high."

"From the commencement of the agitation, which culminated in the enactment of the Interstate Commerce Law, we have believed that all attempts by the National Government or individual states, to regulate and control the passenger and freight traffic on railroads, through or by commissions, was unwise, and that the results of such legislation would be detrimental to the true interests of the people. That the enactment of some of the provisions of that law, has not resulted more disastrously to the commercial interests of the country is, we believe, to be attributed to failure or inability to enforce the same, by the Interstate Commerce Commission."

The new Portland & Rumford Falls road, an extension from Canton to Rumford Falls, about 15 miles, is nearly completed. The surveys of the Bangor & Aroostook from Brownville to Presque Isle and Caribou are completed, and \$900,000 subscriptions to preferred stock have been received. Only \$100,000 more is needed.

The Commissioners commend the Maine Central for keeping cars and station buildings in a neat and clean condition. They renew their former recommendation of a system of grading in each department, and promotions, based upon careful examinations, as a method to secure competency and faithfulness on the part of employees.

Only one passenger of the 5,502,646 carried by steam railroads was killed (and that by his own carelessness), and five injured. The total number accidents in Maine on steam railroads was as follows: Employees killed, 9; injured, 12; passengers, 1 killed and 5 injured; trespassers, 9 killed and 4 injured; others, 4 killed and 1 injured; total, 23 killed and 22 injured.

LOCOMOTIVE BUILDING.

A large locomotive has been built at the Portland, (Me.) Locomotive Works for the Western Counties railroad of Nova Scotia.

The Chicago, St. Paul & Kansas City is remodeling, at the South Park shops, six 17 x 24 locomotives into six-wheel switching engines.

CAR BUILDING.

The Harbor Commissioners of Montreal invite tenders for 50 small cars, 300 boxes for dredging, 60 tons of light rails and a pile-driving engine.

The Pullman Palace Car Co. has recently received orders to build 22 passenger cars for the Southern Pacific and 25 passenger cars for the Central of New Jersey. An order has recently been let by the Chicago, Rock Island & Pacific for a large number of passenger cars.

The Norfolk & Western let contracts last week to the Pullman Palace Car Co. for 1,000 box and 400 coal cars, and also for 25 passenger, 10 baggage, 10 mail and five parlor cars. The freight cars are to be delivered in April, May and June and the passenger equipment in the three following months.

A contract has been let to the Pullman Palace Car Co. for 20 coaches for the Chicago, St. Paul, Minneapolis & Omaha, and for 100 for the Chicago & Northwestern. These are to be delivered at the rate of 30 a month, be-

ginning August, 1892, and the Pullman Company has the option of delivering them more rapidly after Sept. 1, 1892.

The Barney & Smith Mfg. Co. will soon have ready for delivery the 16 vestibule passenger and sleeping cars being built for the Canadian Pacific. Besides these, eight cars are being built in the company's shops at Montreal. The road is also having built six solid vestibule trains to be run between Montreal and St. Paul by way of Sault Ste. Marie. Twelve of the new sleeping cars are to be placed on the route between Montreal, London, Detroit and Chicago next spring.

BRIDGE BUILDING.

Black River, Mich.—The Flint & Pere Marquette Railway Co. will tear down the iron bridge across Black River, and build a new one in its place. The new structure will be several feet wider than the present one and 40 ft. longer. It is proposed to build a new and heavier foundation for the new bridge.

Hallettsville, Tex.—John Buchanan will receive bids until Feb. 8 for constructing an iron bridge on Smother's Creek, in Lavaca County.

Philadelphia.—An ordinance has passed the Philadelphia Councils to enter into contracts with the Pennsylvania, and the Philadelphia & Reading, for the construction of bridges to carry Ontario street, Glenwood and Sedgely avenues and such other streets and avenues as may be required by the Director of Public Works over or under said railroads. The railroad companies are to pay not less than \$100,000 for the work and \$200,000 is to cover the expense to the city.

Sioux City, Ia.—The preliminary survey is being made for a high bridge over the Missouri River for the purpose of determining the location to guide the framers of a bill for a charter which will be introduced in Congress.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In the Federal Court it is laid down that the Missouri statute, which prohibits any railroad company within the state from owning, operating or managing any other parallel or competing railroad within the state, applies only where both the roads are situated within the state and the competition between the two must be of some practical importance, such as is liable to have an appreciable effect on rates. Two railroads which do not touch at any two common points, and between which for a distance of 40 miles another railroad is interposed, and whose traffic, except an unimportant amount, would in no event pass over the other, are not competing lines within the meaning of the statute.

Pursuant to state authority, recognized by and made a part of the congressional grant of March 3, 1871, the Southern Pacific Railroad Co., April 15, 1871, filed amended articles of incorporation; and Aug. 12, 1873, filed, together with the S. P. Branch R. Co., articles of amalgamation and consolidation, under the name of the Southern Pacific Railroad Co. It is held in the Federal Court that while in one sense a new corporation was formed, each was substantially and practically the same S. P. R. Co. mentioned in the acts of Congress, and was so recognized by Congress, and that the articles of amendment, amalgamation and consolidation were authorized by congressional as well as by state legislation.

In North Dakota a deed of land by a railroad company reserved and excepted a strip 400 ft. in width, 200 ft. on each side of the centre line of the road, or any of its branches, for a right of way. Subsequently a separate corporation constructed a line of railroad across the granted land, and then leased the same to the grantor railroad company, which latter company operated the same as a branch of its main line. The Supreme Court rules that whatever interest in the right of way the latter company had, it obtained and held under its lease, and not under the reservation, since that could not operate in favor of a stranger to the deed.

Injuries to Passengers, Employees and Strangers.

In Florida, the Supreme Court rules that an engineer, fireman, brakeman and shoveler on a gravel train, engaged in loading, hauling, and unloading gravel in repair of the road bed are fellow servants, and in the absence of a statute imposing such liability, the railroad company is not liable to one of the shovelers for personal injury received in consequence of the negligence of the engineer in putting the handling of his engine in the hands of his fireman.

In Maine it is held that an engineer and a conductor of a railroad company are fellow servants, and the former cannot recover from the company for injuries caused by the latter's negligence.

In Texas the Supreme Court rules that the fact that at the time of a collision the train on which deceased was working was being moved backwards does not imply an unusual risk not assumed by him, where, ever since his employment thereon a month before, the train has been daily moved in that manner.

In North Dakota it is held by the Supreme Court that an employee of a railroad, riding by right on the platform of a caboose, does not assume the risk arising from the maintenance of a switch stand of such height and in such position that the target will sometimes come in contact with the sides of passing cars, particularly when he knows that the rules of the company prohibit the erection of any such switch stand within less than 6 ft. of the track.

The Supreme Court of Georgia rules that though attempting to couple cars when the engine is running at a speed of 15 miles an hour is apparently not only dangerous but reckless, yet if it be true in the experience of engineers and railroad men that it is safe, provided the engine is properly managed, and if the failure in question resulted solely from the fault of the engineer in manipulating the engine, the high speed will be no obstacle to a recovery by the car coupler for a personal injury sustained by him in making the attempt.

The Supreme Court of Maine rules that a railroad is not liable to an employee for an injury happening to him in executing an errand of danger, upon which he is sent by the superintendent, unless the superintendent be guilty of negligence in ordering the dangerous act to be performed.

In North Dakota a switchman in defendant's employ was injured while coupling an engine to a car because there was not sufficient space for his body between them. The drawbars of the engine and of the car were unusually short, leaving a space of only about 10 in. between the end of the car and of the engine when the drawbars came together, whereas the usual space is from 24 to 30 in. The engine was moving slowly, giving plaintiff ample time to have discovered the defect. The

Supreme Court rules that, in view of the fact that the defect was patent, and that the rules of the company required its employees to exercise great care in examining coupling apparatus, and gave them sufficient time to make the examination, plaintiff could not recover.

In Michigan the Supreme Court rules that evidence that railroad employees operating a freight train, shunted three cars without anyone thereon past a crossing, without any signal or warning, and that they knew that the driver of a team was approaching such crossing, is sufficient to support a finding of gross negligence on the part of the railroad.

In Georgia in an action against a railroad by its engineer for personal injuries sustained in running his train into a washout. It appeared that the culvert at which the washout occurred had withstood storms for 30 years, and that there was no reason for suspecting it of weakness; that shortly before the accident, which was from 30 minutes to 2½ hours before the accident, the section-man examined the culvert, and, it appearing perfectly safe, went four miles up the track, where he apprehended danger, and watched. While there a severe and unprecedented water spout, which he had no reason to apprehend, and of which he did not know until after the accident, occurred at the culvert, causing the washout. The Supreme Court holds the railroad not liable.

- 1 Kimball v. A. T. & S. F. R. Co., 46 Fed. Rep., 888.
- 2 United States v. Southern Pac. R. Co., 46 Fed. Rep., 883.
- 3 Dunstan v. Nor. Pac. R. Co., 49 N. W. Rep., 421.
- 4 Parrish v. P. & A. R. Co., 9 South Rep., 696.
- 5 Lasky v. C. P. Ry. Co., 22 Atl. Rep., 367.
- 6 G. v. S. A. Co. v. Arispe, 17 S. W. Rep., 47.
- 7 Boss v. North. Pac. R. Co., 49 N. W. Rep., 635.
- 8 Rebb v. E. T. V. & G. R. Co., 13 S. E. Rep., 560.
- 9 Lasky v. C. P. Ry. Co., 22 Atl. Rep., 367.
- 10 Bennett v. Nor. Pac. R. Co., 49 N. W. Rep., 408.
- 11 Schindler v. M. L. S. & W. Ry. Co., 49 N. W. Rep., 670.
- 12 Cent. R. & B. Co. v. Kent, 13 S. E. Rep., 502.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

- Buffalo, Rochester & Pittsburgh, quarterly, 1½ per cent. on the preferred stock, payable Feb. 15.
- Cincinnati, Hamilton & Dayton, 1½ per cent., payable Jan. 30.
- Illinois Central, semi-annual, 2½ per cent. in cash, payable March 1.
- North Carolina, semi-annual, 3 per cent., payable March 1.
- Rome, Watertown & Ogdensburg, 1½ per cent., payable Feb. 15.
- Sandusky, Mansfield & Newark, annual, 3½ per cent., payable Feb. 1.
- Toledo & Ohio Central, quarterly, 1 per cent., payable Feb. 25.
- West Virginia Central & Pittsburgh, 1 per cent., payable March 1.
- Wheeling & Lake Erie, quarterly, 1½ per cent., payable Feb. 16.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

- Allegheny & Kinzua, annual, Olean, N. Y., Feb. 9.
- Barclay, annual, 204 Walnut street, Philadelphia, Pa., Feb. 8.
- Brooklyn Elevated, annual, adjourned, 31 Sands street, Brooklyn, N. Y., Feb. 20.
- Camden & Atlantic, annual, Cooper Point, Camden, N. J., Feb. 25.
- Chippewa Valley, annual, Mount Pleasant, Mich., Feb. 17.
- Delaware, Lackawanna & Western, annual, 22 William street, New York City, Feb. 23.
- Guelph Junction, annual, Guelph, Ont., Feb. 2.
- Huntington & Broad Top Mountain Railroad & Coal Co., annual, American Life Building, Philadelphia, Pa., Feb. 2.
- Kansas City, Memphis & Birmingham, annual, Memphis, Tenn., Feb. 3.
- Kansas City, Wyandotte & Northwestern, annual, Kansas City, Mo., Feb. 3.
- Keokuk & Western, annual, Keokuk, Ia., Feb. 3.
- Kingston & Pembroke, annual, Kingston, Ont., Feb. 8.
- Mobile & Ohio, annual, 11 Pine street, New York City, Feb. 4.
- Northern Central, annual, Baltimore, Md., Feb. 25.
- Philadelphia & Erie, annual, Philadelphia, Pa., Feb. 8.
- Scioto Valley & New England, annual, Columbus, O., Feb. 11.
- Southwestern (Georgia), annual, Third street, Macon, Ga., Feb. 11.
- Summit Branch, annual, 233 South Fourth street, Philadelphia, Pa., Feb. 9.
- Wheeling & Lake Erie, annual, Toledo, O., Feb. 2.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

- The Railway Freight Claim Association of the Eastern, Western and Southern States will hold its regular semi-annual meeting at the Grand Pacific Hotel, Chicago, Ill., March 3.
- The New England Railroad Club holds regular meetings, at the United State Hotel, Beach street, Boston, Mass., on the second Monday of each alternate month commencing January.
- The Western Railway Club holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.
- The Southern Railway Club holds regular meetings on the third Thursday of the months of January, February, March, May, September and November at such points as are selected at each meeting.
- The Central Railway Club meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.
- The Northwest Railroad Club meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.
- The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.
- The American Society of Civil Engineers holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.
- The Boston Society of Civil Engineers holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturday of each month. The annual meeting is held on the third Saturday in January. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 39 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o'clock p. m. on the first Friday of each month.

The *Tacoma Society of Civil Engineers and Architects* holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma, Wash.

Association of Engineers of Virginia.

The first annual session of the Association of Engineers of Virginia convened in Roanoke, Va., last week. President Wingate was in the chair, and announced that the following officers had been elected: President, Clarence Coleman; Vice-President, J. H. Wingate; Directors, M. E. Yeatman, J. E. M. Humphreys, W. E. Andrews and C. G. Cushman; Secretary and Treasurer, J. R. Shick. A number of papers on engineering subjects were read.

Canadian Society of Civil Engineers.

The Canadian Society of Civil Engineers held its annual meeting in Montreal last week. The annual report showed that the income for the year amounted to \$4,400, and the general expenditure reached \$3,254. The total number of members includes 60 honorary members, 232 members, and 115 associate members, 70 associates, and 177 students, or 659 in all. The Building Committee reported a lack of interest by the members in the building fund. During the year only \$180 has been received, making a total to the credit of the fund \$3,114, and leaving uncollected subscriptions to the amount of \$402. An invitation from the American Engineers' Association, asking the Canadian Society to co-operate in entertaining visiting foreign engineers at the Chicago World's Fair was the subject of considerable discussion. The answer was left in the hands of the council, it being understood that the meeting was adverse to its acceptance. The election of officers resulted as follows: President, John Kennedy, Montreal; Vice-Presidents, P. A. Peterson, Montreal; W. T. Jennings, Toronto; Thomas Munro, Coteau; Treasurer, Herbert Wallis, Montreal; Secretary, Clemet H. McLeod, Montreal; Librarian, William McNab, Montreal; members of the council, H. T. Bovey, P. W. St. George, K. W. Blackwell, Montreal; J. Hobson, Hamilton; H. G. C. Ketchum, Fredericton, N. B.; H. K. Ruttan, Winnipeg; C. E. W. Dowell, Halifax, N. S.; H. J. Cambie, Vancouver, B. C.; C. H. Keefer, N. S.; D. Lumsden, A. MacDougall, Toronto; F. S. Grisbome, Ottawa; J. D. Barnett, Stafford; F. C. Gamble, Victoria, B. C.; E. A. Hoare, Quebec. Mr. T. C. Keefer moved that the society recommend to the Government of Canada that no more locks be constructed on the St. Lawrence Canal with the length of the chamber established by the Canal Commission in 1871, but that this length should be increased to meet the requirements or the proportion of length to beam in modern naval architecture as established without reference to locks upon the upper lakes and upon the ocean. The discussion was deferred.

Engineering Association of the South.

The regular January meeting was held at the association headquarters, Nashville, Tenn., Jan. 14, Lieut. John Biddle, Corps of Engineers, U. S. A., presiding. The tellers reported the election of Mr. William Hewitt, Engineer and Vice-President of the Trenton Iron Co., Trenton, N. J., and Mr. John S. Walker, U. S. Assistant Engineer, Nashville, Tenn., as members; also Mr. C. F. Nebus, draftsman, Nashville, Tenn., and Mr. William H. Shorley, Assistant Engineer W. & A. P. R. R., Atlanta, Ga., as juniors. The committee, composed of Messrs. Landreth, Kirkpatrick and Fairleigh, appointed at the last meeting to consider the feasibility of holding in the spring of 1892 under the auspices of the association a competitive trial of machinery used in highway construction, reported that they had received favorable

replies from a large number of manufacturers agreeing to take part in the contest. The committee was continued, and directed to submit to the membership a general plan for carrying out the contest.

Mr. W. G. Kirkpatrick then presented a paper on "The Engineering Features of the Cumberland Race Track." This is a regulation track recently built in Nashville under the direction of the writer as engineer. The paper gave a full comparison of the relative advantages and disadvantages of the "kite shaped track" and the "regulation track," the latter of which was finally adopted on account of the difficulty of fitting the "kite shaped track" to the topography of the ground without excessive earthwork.

Engineers' Club of Philadelphia.

The annual meeting was held at the rooms of the club in Philadelphia, Jan. 16, President Wilford Lewis presiding, and about 63 members and six visitors being present. The president in his annual address spoke of the notable growth in the prosperity of the club during the year. He reviewed the progress of the engineering profession in the last year, and referred at length to the rapid consumption of the stores of natural fuel, and held that these are nearer exhausted than is popularly supposed. He referred to the railroad construction of the year, the progress in the use of compound locomotives, and spoke against some of the claims made for cable traction for street railroads in large cities. He also spoke briefly of the World's Fair at Chicago, and of the progress in the manufacture of American ordnance and of the new ships for the navy.

The board of directors reported a very marked increase in the attendance at the meetings. This increase has amounted to nearly 100 per cent. since the policy of issuing advance copies or abstracts of papers was adopted. Forty-seven active and 3 associate members were admitted, and the resignations of 24 active and 3 associate members were presented and accepted during the year. The total number of members of all classes at the end of the year was 421. Over \$300 had been subscribed to the fund for establishing an engineering headquarters and engineering congress at the World's Fair in Chicago in 1893. The tellers of election reported that 23 active members and one associate member had been elected, and that the officers elected for the coming year are: President, James Christie; Vice-Presidents, Frederick H. Lewis and Pedro G. Saloni; Secretary, John C. Trautwine, Jr.; Treasurer, T. Carpenter Smith; Directors, John E. Codman, George V. Cresson, Strickland L. Kneass, Wilfred Lewis, H. W. Spangler, David Townsend.

The charter of the club was accepted and ratified. An amendment to the by-laws, presented at the last meeting, and providing for the appointing of a nominating committee, was amended so as to restrict the duties of the committee to filling such vacancies as may occur in the ticket. The President was directed to appoint a committee to revise the constitution and by-laws, when, in the opinion of the Board of Directors, such appointment becomes necessary.

Mr. Carl Hering moved the appointment of a committee to confer with the other engineering and technical societies of Philadelphia with regard to a plan for co-ordinating a large building for their joint use.

Mr. Rudolph Hering moved that the Committee on Landlocked Navigation appoint a sub-committee to co-operate with similar committees of the Philadelphia Trades League and the New York Board of Trade and Transportation to further the project for a ship canal across the state of New Jersey. Both these motions were deferred until the next business meeting.

Engineers' Club of St. Louis.

At the meeting on Jan. 20, at 8 p. m., President Johnson in the chair, 37 members and three visitors were present. J. P. Seddon was elected a member and J. W. Woerman was proposed for membership.

Mr. Edward Flad read a paper on "An Inclined Cable Railway for Transferring Freight Cars Between the Upper and Lower Yards of the Western Cable Railway Company." He described the construction and operation of a cable road built to transfer freight cars between railroad tracks and a warehouse in St. Louis. The grade of Potomac street, along which the road is built, is such that it is impracticable to operate with a locomotive, hence the cable system was adopted. Two loaded freight cars are transferred at each trip over a maximum grade of 7.2 ft. per 100 ft.

This is the first road of the kind that has ever been constructed and hence it is of special interest. A number of novel features are introduced. There is a safety stop device, by means of which a train weighing 180,000 lbs., moving down grade at the rate of five feet a second, can be stopped within a distance of five feet without serious shock, a hydraulic cushion being provided to take up the energy of the moving loads. Electric signals are transmitted between the train and hoisting engine through an electric wire placed in the core of the steel cable. The paper was illustrated by blue prints giving full details of construction. Discussion followed by Messrs. Farnham, Gayler and Seddon.

Mr. Whitfield Farnham then read the second paper of the evening and gave a full account of the recent disastrous colliery explosion at McAlister, I. T., in mine II of the Osage Coal & Mining Co. The mine is well equipped, having duplicate pumps, steam and electric, duplicate fans situated at considerable distance from hoisting shaft; an electric plant for pumping and lighting, with the engines and boilers, is housed in suitable stone buildings. Two separate openings or escapement shafts besides the air shaft are provided, and are in daily use. The main shaft is 475 ft. deep. The explosion was started at 5:04 p. m., by a blow out or "windy" shot or blast fired contrary to rules before the miners had been hoisted out of the mine. Gas or fire damp was not a factor in the explosion, and powder played no part except as fired in the fatal shot in blasting down the coal. Coal dust seems the only remaining medium capable of carrying the explosion over the 2,000 ft. or more of entries which were affected by the accident. The work of rescue was prompt and effective, but 37 men were brought up dead, and 20 more died in the 12 days following, while about 120 more were more or less injured, principally by burns. Discussions followed by Messrs. Wheeler, Ferguson, Seddon, Potter, Hermann, Crosby, Johnson and Holman.

The Civil Engineers' Club of Cleveland.

A regular meeting was held at the club rooms on Jan. 12, with President Gobeille in the chair and 46 members and visitors present. Mr. Charles W. Hopkinson was elected an active member. A committee was appointed to nominate candidates for officers for the ensuing year. Prof. John N. Stockwell read an interesting paper entitled: "On the Centre of All the Dry Land on the Earth's Surface."

The Illinois Society of Engineers and Surveyors.

The seventh annual meeting of the society is being held at the Grand Pacific Hotel, Chicago, this week, the sessions extending over Jan. 27, 28 and 29. The meeting began with an afternoon session on Wednesday at 3:30 o'clock, the regular sessions being at 9:30 a. m., 3:30 p. m. and 7:30 p. m. The following papers have been promised: "Proper Construction of Brick Culverts on the Public Highways," by G. W. Gastman, of Hudson, Ill.; "Field Measurements for the Granite Viaduct at Granite, Idaho," by E. I. Cantine, of Mullan, Idaho; "Qualities of Water for Domestic Supply and Boiler Use," by D. W. Meade, of Rockford; "State Inspection of Bridges," by E. A. Hill; "Method of Laying the Kite-Shaped Race Track," D. H. Davison, of Minonk; "Roadways," by F. S. Balcom, of Mt. Carmel, Ill., and on other subjects. Reports have been prepared by the committees on land and city surveying, roadways, legislation, mining engineering and on instruments and records. A number of topical questions have been announced for discussion at each of the sessions. The afternoon session on Thursday will be intermitted and a visit made to the Jackson Park to view the progress of the work on the buildings for the World's Fair.

PERSONAL.

—Prof. Palmer C. Ricketts, Mem. Am. Soc. C. E., has been elected Director of the Rensselaer Polytechnic Institute of Troy, N. Y.

—Mr. Thomas Muir, late Manager of the Ontario Car Shops at London, has been appointed Treasurer of the Detroit Electrical Works.

—Mr. Joseph T. Penton, Auditor of the Louisville, New Orleans & Texas, died at Memphis, Tenn., Jan. 22. He was 31 years old and had been Auditor of the road since 1883.

—Mr. Frank W. Stewart, formerly Purchasing Agent of the Ohio Central Railroad, has made an engagement as traveling salesman for the Kalamazoo Railroad Vehicle Co., of Kalamazoo, Mich.

—Mr. W. W. Currier, who was for eight years, and until recently, Superintendent of Transportation of the Rome, Watertown & Ogdensburg, has taken service with the Montana Central, with headquarters at Helena, Mont.

—Mr. Elijah W. Morgan, who was the first President of the Toledo & Ann Arbor Railroad, and very well known in Michigan, died at Ann Arbor, Mich., on Jan. 20. He was born in 1805, and became interested in railroads through his business as a banker.

—Mr. J. F. Tucker, who was connected with the Chicago, Milwaukee & St. Paul, for a number of years as Assistant General Manager and as Assistant to the President, has been recently elected Vice-President and General Manager of the Chicago, Fort Madison & Des Moines.

—Mr. George L. Carey, who died in Brooklyn, Jan. 23, was General Freight Agent of the New York, Lake Erie & Western under the Fisk-Gould management. About ten years ago he was Assistant General Freight Agent of the Old Dominion Steamship Co., but he has not been in active business for some time.

—Mr. I. D. Barton has resigned the General Superintendency of the Long Island Railroad to become General Superintendent of the New York & New England, and not General Manager, as reported last week. He succeeds Mr. D. H. Nichols, formerly General Superintendent of the St. Louis & San Francisco, who is to return to the West.

—Mr. C. W. Cheers has accepted the position of Assistant General Freight Agent of the Kansas City, Memphis & Birmingham Railroad, to which he was appointed a short time ago, and will assume charge, with headquarters at Memphis, on Feb. 1. Mr. Cheers is at present General Manager of the Columbus Southern Railroad, which position he will resign.

—Mr. Samuel Goodman, Assistant General Freight Agent of the New York Central & Hudson River road, has been appointed General Freight Agent of the Rome, Watertown & Ogdensburg, in addition to his present duties. Mr. H. A. Hodge, the present General Freight Agent, has been appointed Assistant General Freight Agent. The office of General Traffic Manager has been abolished.

—The directors of the Pittsburgh, Ft. Wayne & Chicago have elected Charles Lanier, of the banking house of Winslow, Lanier & Co., President, to fill the vacancy caused by the death of the late Mr. Louis H. Meyer, of New York. Mr. Lanier is, in point of service, one of the oldest directors of the company. In the directory he succeeded his father, the late Mr. J. F. D. Lanier, who was one of the original directors of the road.

—Mr. L. A. Emerson, recently Traffic Manager of the Rome, Watertown & Ogdensburg, has been appointed General Traffic Manager of the Central Vermont road. Mr. Emerson had been in charge of the Traffic Department of the Rome, Watertown & Ogdensburg for the last four years. He had been connected with the Missouri Pacific for the previous 10 years and was General Freight Agent of that road between 1884 and 1886.

—Mr. W. G. Richards has resigned his position as Superintendent of the works of the American Steel Wheel Co., at South Boston, Mass. Mr. Richards has had long experience in wheel making, including early service in the manufacture of the Allen paper wheel while the works were at Hudson, N. Y. In his last position he has done important service in inventing and perfecting the processes of making the solid cast steel wheels which are now extensively used. This process was described in the *Railroad Gazette*, June 5, 1891.

—Mr. George Codwise Dickinson died this week at his estate in Virginia, near Cobham, Albemarle County. He was 60 years of age, and was born in New York City. He was educated for the profession of mining and railroad engineering, which he subsequently followed. In early manhood he moved to Virginia, where he has since lived. At the outbreak of the war, he entered the Confederate service as a captain of engineers, and served throughout the war in the Army of Virginia. He has been Chief Engineer of several Southern railroads.

—Mr. Lawrence Myers died at Plainfield, N. J., last week, aged 58 years. Mr. Myers has not been engaged in business for a number of years, but during the civil war he was a member of the firm of P. M. Myers & Co., which performed valuable service for the United States Government as financial agents. Mr. Myers was largely

interested in financing railroads, and was interested, among others, in the Southern Minnesota and the Richmond & Allegheny Railroad. He was appointed a receiver for the latter road, and at the conclusion of that service practically retired from business affairs.

—Mr. B. W. McCullough, General Passenger and Ticket Agent of the Texas & Pacific, died at Hot Springs, Ark., Jan. 20. Mr. McCullough was one of the best known of the Texas railroad traffic men, and had resided in the state since 1877. He was born at Sidney, O., and was about 50 years old. After the civil war he became chief clerk of the passenger department of the Grand Rapids & Indiana road, but left that position to accept a similar one on the International & Great Northern. Mr. McCullough later became General Agent of the International & Great Northern, and when it became part of the Missouri Pacific he was appointed General Passenger and Ticket Agent of that road for the district south of Texarkana. When the Missouri, Kansas & Texas and the International Great Northern were separated from the Missouri Pacific he resigned from those roads and continued as General Passenger and Ticket Agent of the Texas & Pacific.

—Mr. James T. Furber, Vice-President and General Manager of the Boston & Maine, died at his home at Lawrence, Jan. 27, of pneumonia, after a week's illness. Mr. Furber began his railroad career on the Boston & Maine, and, excepting a short time which he spent on the New York, Lake Erie & Western as Station Agent at Jersey City, he was connected with that road continuously. He was for many years station agent at Great Falls, N. H. and Lawrence, Mass., and later became General Freight Agent. In 1873 he was appointed General Superintendent of the Boston & Maine, and for the last 19 years has been practically the General Manager of the road. He was elected Vice-President last year. Mr. Furber was a strong-minded and honest railroad man, and managed the road with untiring energy and conscientiousness, as well as marked ability. During his administration the road has grown from a comparatively small line to a system of nearly 2,000 miles, largely by the lease of competing lines, so that the company has in most of its territory very little competition.

—Mr. A. G. Darwin died at his home in Glenridge, N. J., Jan. 21, at the age of 65. Death was caused by nervous prostration and heart trouble. Mr. Darwin was born at Millville, N. Y., and was a son of the late Rev. Alanson Darwin. His early railroad work was as Superintendent on western lines. In 1870 he came to New York and engaged in the real estate business. He was for six or seven years President of the Allan Paper Car Wheel Co. He was also President of the Strong Locomotive Co., the San Juan Mining Co., of Colorado, and Treasurer of the Union Construction Co., now building the Kickapoo Valley & Northern Railroad in Wisconsin. He was also a Director in the New York & Long Island Railway Co. (tunnel route), and the Manhattan Quilting Co. Mr. Darwin lived at Glenridge for 15 years, and built more than half the houses in the place. He was instrumental in the erection of the handsome railroad station, the club house and public hall. He was a member of the Montclair Club, and a governor of the Essex County Country Club, at Hutton Park. He leaves a widow and two grown children.

ELECTIONS AND APPOINTMENTS.

Arcadia, Gulf Coast & Lakeland.—The following is a revised list of the officers: Anthony Peters, President, Boston; Edward Kakas, Vice-President, Boston; William G. Dacey, Second Vice-President, 2 Wall street, New York City; Frederick C. Peters, Treasurer, Arcadia, Fla.; William B. Rand, Secretary, Boston, and John H. Powers, Chief Engineer, Arcadia, Fla.

Atchison, Topeka & Santa Fe.—H. C. Ives, assistant to the President, has accepted the superintendency of the Chicago and Kansas City Division of the road. He succeeds on Feb. 1 A. Turner, who will be transferred to the traffic department. Mr. Ives has been Division Superintendent on the Wisconsin Central and the Great Northern.

Atlantic & Pacific.—C. N. Sterry has been appointed General Attorney of this company, with headquarters at Albuquerque, New Mexico, in place of William C. Hazeldine, deceased.

Bloomington & Sullivan.—At the annual election of the company, held at Bloomington, Pa., Jan. 12, F. M. Leuder was re-elected General Manager, Auditor and Purchasing Agent.

Chesapeake, Shenandoah & Western.—The incorporators of this Virginia company are: J. Hotchkiss, H. M. Bell, M. Erskine Miller, R. H. Catlett and J. N. Stubbs, of Shenandoah, Va.

Chicago, St. Paul, Minneapolis & Omaha.—Lyman Sholes, heretofore General Agent at Omaha, has been appointed Division Freight Agent, with headquarters at the same city.

Coahuila & Durango.—The company has been incorporated by H. A. Pesley, George H. Parsons, James M. Bolton, R. H. Graham and John E. Lundstrom, of Colorado Springs, Colo., to build a railroad in Mexico and New Mexico.

Lake Shore & Michigan Southern.—The headquarters of J. R. Reniff, recently appointed Master Car Builder for the Toledo Division will be at Norwalk, O., instead of Toledo, as recently reported. He succeeds B. F. Rumberger, resigned.

Marion & Rye Valley.—The company has been organized with P. S. Swain, of New York, President; G. W. Richardson, of Marion, Va., Vice-President, and J. S. Apperson, Secretary.

Middle Georgia & Atlantic.—At a meeting at Savannah last week of the Seaboard Co., the construction company for this road, the following Directors were elected: William Garrard, J. P. Williams, I. G. Haas, William Kehoe, Edward Karow, H. T. Moore, B. H. Levy, Savannah; W. C. Clark, Covington, Ga.; W. B. Thomas, Atlanta, Ga.; W. E. Baskette, Chattanooga, Tenn.; Charles Benner, New York; John Morrison, Ellabell, Ga.; H. S. Stephens, Philadelphia.

Missouri, Kansas & Texas.—Robert Walker has been appointed Superintendent of the car department, and John Boyle has been appointed Master Carbuilder, succeeding Mr. Walker.

Missouri Pacific.—Frederick Knowland has been appointed General Eastern Freight Agent of the system, with headquarters in New York City. He succeeds H.

C. Logan, deceased. Mr. Knowland once represented the Union Pacific in New York.

John McCormick Superintendent of the New Mexico division, has been recently transferred to the Colorado division.

New York & New England.—I. D. Barton has been appointed General Superintendent with headquarters at Boston. C. N. Woodward has been appointed Chief Train Dispatcher on the section between Boston and East Hartford, Conn.

Northern Pacific.—John Dorsey, Assistant Superintendent of the Rocky Mountain Division of the Northern Pacific Railway, has been recently promoted to Superintendent of the Yellowstone Division, and J. R. Boyd, formerly Chief Train Dispatcher, has been promoted to Mr. Dorsey's position.

Omaha, Kansas Central & Galveston.—At the annual meeting of this company recently held, the following officers were elected: President, S. O. Constant, New York City; Vice President, C. M. Rawlings, Lyons, Kan., and Secretary, V. Sillo, New York City.

Paducah, Tennessee & Alabama.—W. J. Hills has been appointed Assistant Superintendent of the road, with headquarters at Paducah, Ky.

Piedmont & Cumberland.—R. C. Kerens was re-elected President, and Major E. W. S. Moore Secretary and Treasurer at the recent meeting.

Pittsburgh, Fort Wayne & Chicago.—Charles Lanier, of New York, has been elected President of the company, and John S. Kennedy, also of New York, has been elected a director, to fill a vacancy caused by the death of L. H. Meyer.

Pittsburgh & Lake Erie.—At the annual meeting of the company at Pittsburgh, Jan. 28, the following officers were elected: President, John Newell, Cleveland, O.; Directors, Cornelius Vanderbilt, William K. Vanderbilt, F. W. Vanderbilt, Hamilton McK. Twombly, E. D. Worcester, New York; M. W. Watson, Henry Rice, James L. Bennett, James M. Bailey, F. H. Reed, E. M. Schooner and D. L. Wilson, Pittsburgh.

Potomac River & Great Falls.—The incorporators are R. W. Moore, B. F. Mackall, S. R. Donohue, J. M. Love and D. S. Mackall, of Virginia, and Henry Wise Garnett and S. P. Ficklin, of the District of Columbia.

Prescott & Northwestern.—The following are the Directors of the reorganized company: Benjamin Whitaker, of Texarkana, Tex.; K. T. Powers, W. B. Walker, William G. Harrington, of Prescott, Ark., and William N. Bemis, of Jefferson, Tex. The officers are: Benjamin Whitaker, President; W. B. Walker, Vice-President; J. C. Young, Secretary, and John Delahoyde, Treasurer.

Richmond, Blackstone & Southern.—The following are the incorporators named in the Virginia charter: Freeman Epes, R. W. Tuggle, T. M. Dillard, James L. Anderson, Thomas R. Hardaway, J. M. Harris, H. Vaden, of Virginia, and Frank P. Bennett, of Massachusetts.

Richmond & Danville.—P. J. McGovern, of Louisville, Ky., has been appointed Chief Clerk to the Traffic Manager of this road. Mr. McGovern lately resigned his position of Assistant General Freight Agent of the Louisville & Nashville.

Rome, Watertown & Ogdensburg.—Samuel Goodman, Assistant General Freight Agent of the New York Central, has been appointed General Freight Agent of the Rome, Watertown & Ogdensburg, with headquarters at New York. He remains Assistant General Agent of the Central. H. A. Hodge has been appointed Assistant General Freight Agent, with headquarters at Watertown.

Salem & Craig.—J. W. Marshall, A. E. Humphrey and others, of New Castle, Va.; J. C. Langhorne and J. W. P. Allemon, of Salem, Va., and others are the incorporators of this company, which has applied for a charter in Virginia.

Salem & Southern.—A. B. Bowman, J. C. Langhorne, T. M. Starkey, George W. Palmer, J. W. Berry and others are the incorporators of this new Virginia railroad.

Sandusky, Mansfield & Newark.—At the annual meeting of the stockholders at Sandusky, O., Jan. 20, John Gardiner and E. G. Gardiner, of Norwalk, O.; Jay O. Moss, Clark Rude, C. H. Moss and A. C. Moss, of Sandusky; L. J. Tracy, of Mansfield, and C. F. Meyer and Robert Garrett, of Baltimore, were elected directors. John Gardiner was elected President, and Jay O. Moss Vice-President and Treasurer.

San Francisco & North Pacific.—The annual meeting of the stockholders of the company was held at San Francisco, Cal., Jan. 19, when the following directors were elected for the ensuing year: J. F. Burgin, Peter J. McGlynn, Alfred L. Seligman, P. N. Lillenthal, Charles F. Hanlon, Russell J. Wilson and Henry T. Scott. J. F. Burgin was elected President; P. N. Lillenthal, Vice-President; Alfred L. Seligman, Treasurer; Henry C. Whiting, General Manager, and Thomas Mellersh was appointed Secretary and Controller.

Southwest Virginia Central.—The incorporators of the company are: R. H. Adams, J. L. Radford and A. Robinson, Radford, Va.; H. D. Ribble, N. R. Stanger, Blacksburg, Va.; J. W. Marshall, New Castle, Va.; Decatur Axtell, Richmond, Va., and others.

Tennessee, Ashville & Coosa.—The following Directors were elected at a meeting at Ashville, Ala., last week: Andrew Johnson and R. H. Williams, of Chattanooga, Tenn.; Judge L. F. Box and J. A. Embrey, of Ashville, Ala. The Directors elected the following officers: A. Johnson, President and General Manager; Judge L. F. Box, Vice-President; R. H. Williams, Secretary and Treasurer.

Trinity, Cameron & Western.—The following officers were elected at a recent meeting at Cameron, Tex.: John M. Hefley, President; N. S. Walton, Vice-President; R. Lyles, General Manager; Monta J. Moore, Secretary and Treasurer. John M. Hefley, R. Lyles, N. S. Walton and Monta J. Moore were authorized to contract for the building of the road.

West Virginia Central & Pittsburgh.—At the annual meeting at Piedmont, W. Va., the following directors were re-elected: H. G. Davis, S. B. Elkins, William W. Taylor, John A. Hambleton, Thomas B. Davis, James G. Blaine and R. C. Kerens. The board organized by the election of H. G. Davis, President; S. B. Elkins, Vice-President, and Edward S. Moore, Secretary and Treasurer.

West Virginia & Pennsylvania.—At a meeting at Fairmount, W. Va., the following officers were elected: R. T. Lowndes, President; Joseph E. Sands, Secretary, and J. C. Beeson, Treasurer.

RAILROAD CONSTRUCTION. Incorporations, Surveys, Etc.

Adirondack & St. Lawrence.—Work on the new road near Remsen, N. Y., for the past four weeks has been progressing slowly. The recent storms and cold weather have delayed matters greatly, but an effort is being made to push the work with a largely increased force. The Black River bridge is nearly completed and the first train will cross the bridge the latter part of this week. As soon as the track is laid to Woodhull Creek that bridge will be put in place at once by the Elmira Bridge Co., of Elmira.

Abnapee & Western.—The contract for building this road, which is to be a branch of the Keweenaw, Green Bay & Western, has been let to McDougal & Beaton, of Milwaukee. The line to be built is 13 miles long, extending from Luxemburg, west of Keweenaw, on the Keweenaw, Green Bay & Western, northeast to Abnapee, Wis., on Lake Michigan. It is proposed to extend the line 18 miles further north to Sturgeon Bay, but no definite arrangements have been made for building this part of the line.

Arcadia, Gulf Coast & Lakeland.—Contracts for building and completing the 80 miles of this road from Lakeland, Fla., have been recently let to Gaboury, Armstrong & Co., of Rome, Ga. The contractors have already commenced the grading and at present probably about 10 miles of this work has been finished. The first section of 20 miles is to be graded by the middle of February. The line extends through a level country in the middle and western part of Florida and will include for the most part only easy earthwork. Most of the streams to be crossed are not navigable, and as no drawbridges will be required the bridge work will be inexpensive. The road is projected to traverse the phosphate district of Florida, starting at Lakeland on the north and extending in a southwesterly direction through Keyville to Bradenton and Sarasota. The second line is to be built from Keyville, a few miles from Lakeland in a southeasterly direction to Arcadia, and thence south west along the west bank of the Peace River to the main entrance to Charlotte Harbor at Boca Grande. The aggregate length of the road with branches will be 178 miles. The branch to Sarasota, which is the line under contract, has been surveyed six times, and five surveys have been made for the line between Keyville and Boca Grande. First mortgage bonds have been authorized by the company at the rate of \$10,000 a mile, the capital stock being \$7,500 a mile.

Atlantic, Staunton & West Virginia.—A bill has been introduced in the Virginia legislature to incorporate this company, with Henry Hutchinson, O. K. Lapham, J. W. Bodley, Reeves Catt, E. C. Vincent and others as incorporators. The company is authorized to build a railroad from the York or Potomac River, near the Chesapeake Bay, west to Staunton, Va., and a point on the West Virginia line.

Austin & Northwestern.—Ricker, Lee & Co., of Galveston, Tex., have been awarded the contract for building the 10 miles of the extension from Fairland, near Marble Falls, west to the Llano iron mines, a distance of 20 miles. The locating survey has just been completed to Llano. The contract just let includes the bridge over the Colorado River.

Bellingham Bay & Eastern.—The contract of A. L. McCoy & Co., of Tacoma, Wash., to build the road has been confirmed, and the firm has begun the grading near New Whatcom, Wash. Edward Eldridge is President and J. J. Donovan, of Fairhaven, is Secretary.

Berkley & South Mills.—A bill has been introduced in the Virginia legislature to charter this company to build a railroad from Berkley on the Southern branch of the Elizabeth River near Portsmouth to South Mills, N. C. This is practically the same line as that of the Norfolk & South Mills Railroad, which recently applied to the legislature for a charter.

Burlington & Missouri River.—The tracklaying recently begun on the graded road beyond Beverly, Neb., has been completed to Wauweta, Neb., 24 miles northwest, where the work will be suspended for the present. The road is graded beyond Wauweta, toward Holyoke, Col., and the line may be completed to that point soon. It is proposed to begin the operation of the line to Wauweta Jan. 28, and the towns have arranged for a demonstration that day.

Cambria & Clearfield.—The contractors are working from both ends of this branch of the Pennsylvania, and it is expected that the tracklaying will be completed this week. The grading has been completed for some time between Kaylor and Brubaker Junction, a distance of about 20 miles. D. F. Keenan, of Westover, Pa., has the contract for tracklaying on the northern section, and Keller & Crossen, of Loretto, Pa., are the contractors for the tracklaying on the southern end. The branch now being completed is a line extending from Kaylor, on the Ebensburg & Treason, east of Ebensburg, north along Chest Creek and Walnut Run to the connection with the line now in operation for a few miles south of La Jone on the Pennsylvania & Northwestern.

Cambridge, Minneapolis & Duluth.—This company has been incorporated in Minnesota, with a capital stock of \$500,000, for the purpose of building a line from Cambridge, Minn., to the St. Paul & Duluth, connecting with that line at North Branch or Harris. The organization has been previously reported. The officers are: H. F. Baker, President; D. O. Anderson, Vice-President; C. W. Van Wormer, Secretary, and O. A. Hollin, Treasurer.

Canadian Roads.—Among the companies applying at this session of the Canadian Parliament for amendments of their charters, extending the time for construction, are the Wood Mountain & Qu Appelle; Lake Manitoba; Manitoba & Southeastern; and Belleville & Lake Nipissing. Application has been made for a charter to build a line from Carp to Sharbot Lake, Ont., and for a charter for the Vancouver Northern, Peace River & Alaska.

Central Counties.—A branch now surveyed, will probably be built next summer between South Indian and Rockland, Que., which is expected to be of convenience in shipping lumber from the mills at Rockland. A second branch will be built between Caledonia Springs and Vankleek Hill, Que., on the line now in operation.

Champion Lumber Company.—A corrected statement is sent us concerning the railroad being built by this company. Only about one mile has been graded so far, from the mills at Orvisburg, Minn., on the New

Orleans & Northeastern Railroad.—The track is now being laid on this road, about 75 men being employed in the construction work. The line is standard gauge and 35-lb. rails are being laid. Funds have been subscribed to complete the line as projected by May 1 next. The new road is being built chiefly for the use of the lumber company. N. M. Brandon, of Meridian, is Chief Engineer.

Chesapeake, Fredericksburg & Western.—A bill allowing this railroad two years to commence the construction of its road is under consideration in the Virginia legislature. The road is to commence near Tidewater in the counties of Gloucester, Mathews or Middlesex and extend thence by the city of Fredericksburg to a point on the West Virginia line in the counties of Augusta or Rockingham. The incorporators are Judson J. Embury, P. V. D. Conway and W. A. Little, of Virginia, and Levi E. Thorne and Edwin Bolitho, of New York.

Chicago, Fort Madison & Des Moines.—It is reported that the company has arranged to complete the extension to Ottumwa, Ia., early in the spring, and that the line may then be continued still further west. The road is now in operation to Libertyville and considerable grading has been done west of that point on the 20 miles to Ottumwa. Very little work would be required beyond repairing the grade before the tracklaying could be commenced. It is understood that the rails have been purchased.

Chicago, Keokuk & Southwestern.—Articles of incorporation were filed in Illinois last week by this company. It proposes to operate a railroad from Havana west about 75 miles to Keokuk, Ia. The capital stock is \$1,000,000. The incorporators are William Logan, W. K. Johnson, George D. Rand, James H. Anderson and James W. Summers, of Keokuk; M. Leroy and Henry R. Dickinson, of Hamilton, Ill.; Thomas Haner, of Vermont, and George Edmunds, of Carthage, Ill. The survey is being made, at present the engineers being near Carthage.

Deer Creek & Susquehanna.—At a recent election of Directors of the railroad company it was stated that the affairs of the road are in a favorable condition, and in a short time, probably, there will be arrangements made which will insure the completion of the road from Belair to Stafford, Ind., at least.

Delaware & Hudson Canal Co.—The company has awarded a contract to Shanahan & Son, of Tribes Hill, N. Y., to rebuild the roadbed about two miles north of Crown Point, N. Y., further inland, at the point where the old bed sank 20 ft. in depth for a distance of 200 ft. The gap at the time was closed with a Georgia pine trestle. This change of bed necessitates a cut through rock 3,500 ft. in length and an average depth of 25 ft., and a shallow fill of about 500 ft. Twenty-nine thousand cubic feet of rock are to be blasted.

Deming & Utah.—Incorporated in New Mexico to build a railroad from Deming, Grant County, to Gallup Bernalillo County. The incorporators are: Gustav Wormser, F. H. Siebold, D. Bannan, David A. R. McLaren, all of Deming, and I. L. Fielder, of Silver City, N. M. The capital stock is \$3,000,000.

Denver, Lakewood & Golden.—It is reported that negotiations are about concluded for the sale of this road, which is built for some 15 miles west of Denver, to a syndicate of Denver capitalists, who were making the purchase in the interests of the Denver, Apex & Western Railroad, which proposes to build a line from Denver West, to Georgetown, Col.

Gladesville.—This company has applied to the Virginia Legislature for incorporation. It is proposed to construct a road from Gladesville in Wise County and to a point on the Norfolk & Western or the Louisville & Nashville. The incorporators are: E. M. Fulton, J. E. Lipps, N. B. Dotson, C. F. Flannery, T. G. Wells, T. M. Anderson, O. M. Vickers, R. P. Bruce, J. C. Richmond and others.

Great Northwest Central.—It is said on good authority that this railroad will build a line to Carberry, Man., this summer, providing that the town and neighboring municipalities grant suitable bonuses. The grade of the old Souris & Hockey Mountain line, which intersects the road south of Rapid City, Man., will be utilized for this branch if it is built.

Gulf & Ship Island.—The railroad is said to have been purchased by Chicago capitalists, who propose to build the line through to Jackson, Tenn., a distance of about 280 miles. The road is completed from Gulfport, Miss., north 20 miles. W. H. Hardy, Meridian, Miss., is President.

Jersey City, Newark & Western.—The principal work which the contractors are now engaged on is the work across Berge Neck, and on the line adjoining the Newark Bay drawbridge. The Newark Bay bridge will be over a mile long altogether. The firms who have not yet completed their contracts are G. W. Rogers & Co., 44 Broadway, New York City; John Shields, Flemington, N. J.; Rehill & Edwards, Jersey City; Ross & Sanford, Jersey City; I. H. Hathaway & Co., Philadelphia; Pen-cord Bridge Co., Philadelphia, and the Elmira Bridge Co., of Elmira, N. Y.

Johnsonburg & Bradford.—The work of clearing on the location south of Bradford, Pa., was practically completed this week. The contractors have begun the grading within a few days, and the number of men now at work is between 200 and 300. The line is to extend from Howard Junction, near Bradford, to Johnsonburg, Pa., 20 miles. The contract for the grading, masonry and trestles has been let to Brendlinger, Nearing & Kelly, of New York City, their present headquarters being at Bradford, Pa.

Mankato & Northeastern.—Articles of incorporation have been filed in Minnesota with a capital stock of \$1,000,000. The company was recently organized at Mankato, Minn., and as previously reported proposes to build a road from Mankato northeast to a point on the Mississippi River, probably Hastings. It is thought, however, that the line will be extended to some Lake Superior point. The officers are P. H. Carney, President; J. D. Hilger, Vice-President; J. G. Fowler, Secretary; D. L. Rose, Treasurer.

Mexican Gulf, Pacific & Puget Sound.—The President reports that the locating surveys are now being made north of Pensacola, Fla., for 100 miles. The surveys and profiles have been made, he says, for the entire line from Pensacola to Memphis. The contract to build the road has been let to the South and West Land Development and Railroad Construction Company. The length of the road will be, he estimates, about 430 miles. The

President is S. N. Van Praag, of Pensacola, and the Secretary is C. H. Dishman, of Nashville.

Mexican Southern.—The track on this line has been laid from Puebla as far south as Cuicatlan, State of Oaxaca, Mexico, 255 kilometres or 160 miles. The grading has been finished, ready for track, from Cuicatlan to kilometre 271 from Puebla. The construction is being actively pushed to the city of Oaxaca, 367 kilometres from Puebla, and should be finished by next September. The number of men now at work is between 4,500 and 5,000. Track was laid during the year 1891 from kilometre 175 to kilometre 255, equal to 80 kilometres, or 50 miles, and the line is now in operation from Puebla to Tecomavaca, 224 kilometres. Read, Campbell & Co. are the contractors. Wm. Morcom, of Puebla, is manager.

Newfoundland.—Reid, Middleton & Co., of Montreal, contractors for the construction of this road, have 65 miles, out of the 270 miles under contract, completed and in running order.

New Roads.—Capitalists from New Castle, Pa., and Jamestown have commenced to build a branch road from Ellwood Junction to coal land south of Ellwood, Pa. The branch will be 3½ miles long and will run up the valley from Thomson Run. It will be an extension of the Beaver & Ellwood road.

A company is being organized at Ottumwa, Ia., to build a line of railroad to Tremont, 18 miles north of that city, connecting with the Chicago & Northwestern and the Iowa Central roads touching that point, giving these roads direct communication to Ottumwa.

A meeting was held at Durango, Col., to arrange for building a railroad from Durango to Creede, Col. The line is from Durango to Florida River, thence to Pine River, along Pine River, through the Womich Pass, thence down the Rio Grande to Creede. The grade is an easy one, and the new line will be less than 75 miles. H. H. Strater and H. J. Arnold, of Durango, are interested.

Norfolk & Western.—The belt line at Christiansburg, Va., noted last week, is being built by this company, and will be completed early in the spring, the contractors for the work being Rogers & O'Brien, of Roanoke. The line is three miles long and is to extend around the city of Christiansburg, and will develop red hematite iron ore fields near that city.

Norfolk, Wilmington & Charleston.—A surveying party in charge of George M. Brockman, of Norfolk, Va., has commenced the survey of the road from Charleston, S. C., northward. Other parties of engineers are in this field, and it is expected that the preliminary survey from Norfolk to Charleston will be completed by March 1.

Northern Pacific.—The attorneys of the company are preparing a trust deed under which the \$3,347,000 now deposited with the Farmers' Loan & Trust Co., of New York, to the credit of the preferred stock, will be placed. The bonds when originally set aside for the preferred stock were not placed in trust, and this is what the new deed aims to do.

Otis Elevating.—The organization of this company has been completed, the right of way acquired, contracts for construction signed, and work commenced. The road is to be 7,000 ft. long from a point connecting with the Catskill Mountain Railroad near Palenville, N. Y., to the summit of the mountain near the Catskill Mountain House and the Kaaterskill Hotel. The elevation to be overcome is 1,800 ft. The contractors are Charles L. Buckle for timber work, Pennel & O'Brien for grading and masonry, and Otis Brothers & Co., of New York, who agree to have the road in operation on or before July 1. Among those interested in this scheme are: Orrin Day, Frederick Hill, Isaac Prayn, C. L. Beach, of Catskill, N. Y., and C. L. Dickerson, William R. Grace, A. Van Santvoord, Col. C. G. Otis and William H. Ritter, of New York. The supervising engineer is Thomas E. Brown, Jr.

Pennsylvania.—Work has begun on the new branch from Allen's lane, on the Chestnut Hill division, north along White Marsh Valley to the Trenton cut off at Fort Washington, Pa. A large force of laborers under contractors Keller & Crossen, of Lancaster, have commenced the four miles of grading. The roadbed will be wide enough for double tracks the entire distance. John T. Dyer, of Norristown, has the contract for the two miles east of Fort Washington. The line is six miles long.

Philadelphia & Reading.—The branch of the road to Frankford, near Philadelphia, Ia., it is said, now assured. The right of way from Frankford to Tabor Station has, with the exception of one property, been secured, and the amount necessary for building the road is already subscribed, principally by the residents along the route.

Potomac River & Great Falls.—A bill has been introduced in the Virginia legislature to incorporate the company to construct a road from Great Falls, in Fairfax County, Va., to a point on the Potomac River between Great Falls and the city of Alexandria. The capital stock is \$250,000.

Ports Valley Railroad & Iron Co.—A bill has been introduced in the Virginia legislature to charter this company, to construct a road from a point on the Chesapeake & Ohio near Covington south, to connect with the Norfolk & Western Railroad near Big Stony Creek, in Giles County.

Prescott & Northwestern.—New articles of incorporation were filed in Arkansas last week amending the charter granted Oct. 6, 1893, and reorganizing the company. The road as far as constructed extends from Prescott County, Ark., northwesterly through Nevada County into Hempstead County. The part to be constructed runs in the same general direction through Hempstead County and into Pike County. The capital stock is \$30,000.

Red River Valley.—Articles of incorporation were filed with the Secretary of State of Minnesota on the 25th inst. The direction of the line is not given, but the principal terminal is to be East Grand Forks, Minn. The incorporators are J. J. Hall, of St. Paul, and C. W. Peterson, of Grand Forks. Capital stock, \$100,000.

Ri hmond, Blackstone & Southern.—The company has applied to the Virginia legislature for a charter, with Freeman Epes, R. W. Tuggle, James L. Anderson and others as incorporators. The company is to build a railroad from Richmond or Manchester southwest through Chesterfield, Amelia and Nottoway counties to Blackstone, and thence to the North Carolina line at a point near Henderson or Ridgeway.

Roanoke & New Castle.—This company, whose incorporation in Virginia was noted last week, has been

organized by A. Z. Koiner, R. H. Woodrum, J. T. Engleby, of Salem, Va., and others to build a railroad from Roanoke to connect with a line in Craig County and to extend to the Kentucky State line.

Rochester & Honeoye Valley.—The laying of the rails on the Honeoye Valley branch has been completed from the Lehigh Valley Junction south to Red Creek. The contractors are laying 3,000 ft. of track a day toward Rochester, N. Y.

Sandusky & Columbus Short Line.—It was not stated in the account printed last week that a contract had already been awarded to a construction company for completing the line to Columbus, O. The contracts now to be let are sub-contracts and will be let by March 15, and possibly at an earlier date. They will probably be in 10-mile sections, and 10 sections may be let at the time stated, or perhaps only three sections. The 13 miles of track laid south of Sandusky to Bellevue will soon be ballasted and put in operation. South of Bellevue complete surveys have been practically made since Dec. 1 last to Columbus. There are now three engineering parties completing the surveys. Three different lines have been run to Columbus, and for part of the distance four routes have been surveyed. The work to be let in the spring will consist almost entirely of earthwork, with maximum grades of 40 ft. to the mile, and the maximum curvature outside the city will be only three degrees. There are only four bridges to be built, 180 ft., and 120 ft., and two 80 ft. long. F. J. Aid, of Marion, O., is Chief Engineer.

Southern California.—The extension of the San Bernardino & Eastern line between San Bernardino and Mentone, Cal., seven miles, which was recently completed, has been opened for traffic. The building of the new branch completes a belt line through the East San Bernardino Valley, the line passing through Highland, Mentone, Redlands and Victoria to San Bernardino. The company announces the inauguration of excursion service over 100 miles of road, between the San Bernardino Valley and Los Angeles, which it calls the "kite shaped track."

Southern Pacific.—The work upon 18 miles of the new track at Yuma, Ariz., on the new location, has been completed and has become a part of the main line over which the regular trains are running. The entire section of new line will be about 30 miles long, and when it is completed, which will be in a very short time, all danger of floods will have been averted. At Summit, just east of Benson, three miles of the track will be moved to higher ground to avoid danger from washouts.

Tallapoosa.—The Tallapoosa Lumber, Manufacturing & Railroad Co. has commenced the construction of 24 miles of standard gauge road from Tallapoosa, Ga., and expects to extend the road to a connection with the Central of Georgia at Roanoke, Ala.

Trinity, Cameron & Western.—The charter for the company was filed in Texas last week. The road to be built is from Trinity west through Cameron to Granger, Tex., a distance of 100 miles. The company was organized at Trinity and Cameron last fall, and the preliminary survey between Cameron and Granger has just been finished. The engineers are preparing the profile and estimates. Part of the right of way has been obtained. J. M. Hefley, of Cameron, is President.

Velasco Terminal.—The tracklaying has been completed between Velasco and Chenango Junction, 22 miles, the last rail having been laid at the latter place Jan. 24. The road was built by the Brazos River Channel and Dock Co., and connects at Chenango Junction with the Columbia branch of the International & Great Northern. It is proposed to run trains from Houston, over the Columbia branch, and to Velasco, about 60 miles south of Houston. Velasco is situated on the deep water harbor at the mouth of the Brazos River, south of Galveston. Burkett, Burns & Murphy, of Fort Worth, Tex., were the contractors for the road now completed. Downey Bros. have a contract for an extension three miles long, from Velasco along the Gulf coast.

Virginia Roads.—Bills have been introduced in the Virginia legislature to incorporate the Richmond, Nottoway & Blackstone and the Gladesville roads, and to amend the charters of the Chesapeake, Fredericksburg & Western and the Metropolitan Western.

Williamsport & North Branch.—This railroad, in operation between Halls Station on the Philadelphia & Reading and Nordmont, Sullivan County, Pa., of which George L. Sanderson has been President, has passed into the hands of H. L. Taylor, of Buffalo, N. Y. He secured by purchase a controlling interest in the property. The company will be reorganized and some extensions may be expected. Among them may be the construction of the line from Halls to Williamsport, a distance of nine miles.

Williams Valley.—Trains are running on the three miles from Tower City to the connection with the Philadelphia & Reading near Brookside, Pa. The grade between the two towns is quite heavy, the road being in a mountainous part of Schuylkill County. It is proposed to extend it west a few miles toward the Susquehanna River to Lykens and a connection with the Northern Central.

GENERAL RAILROAD NEWS.

Birmingham, Powderly & Bessemer.—A suit has been brought in the United States Court, at Birmingham, Ala., on the petition of the Mercantile Trust & Deposit Co., of Baltimore, for the foreclosure of the first and second mortgages on the property.

Central Counties.—A special general meeting will be held at Ottawa on Feb. 16 for the purpose of authorizing the directors to issue new bonds, and to confirm a mortgage deed upon the property of the company and to ratify a lease of the completed section of the road to the Canada Atlantic.

Central New England & Western.—The Philadelphia & Reading has arranged for the transfer of the Poughkeepsie Bridge lines to its system through a guarantee of the bonds of this railroad and of the Poughkeepsie Bridge Co. The agreement is made through the Delaware & New England, the controlling company, which owns all the stock of the railroad companies and a majority of that of the bridge company. A bondholders' committee controls a majority of the bonds of the bridge, and it is said that the committee may oppose some of the terms of the guarantee, but the bondholders of the railroad have approved the transaction. The Reading is to give a guarantee of

\$3,750,000 in four per cent. bonds to replace the six per cent. bonds of the railroad company, amounting to \$5,000,000. That is, a four per cent. bond is given for 75 per cent. of the present bonds. The Delaware & New England will transfer two-thirds of the stock of the bridge company. The bonded indebtedness of the bridge is \$5,000,000, the bonds and preferred stock of the Central New England amount to \$4,100,000, and the bonds of the Delaware & New England to \$1,300,000.

Chattanooga Southern.—Newman Erb, of Kansas City, has been appointed Receiver by the Judge of the United States District Court at New Orleans, on the petition of E. Summerfield, a bondholder, who alleges that the road does not earn its fixed charges, has not paid the interest on its bonds, and asserts that the trustee of the bonds, the Central Trust Company, is disqualified from acting for the interest of the bondholders.

East Line & Red River.—The road was sold at Jefferson, Tex., last week to Simon Sterne, acting as attorney for Henry W. Poor, the Trustee of the first mortgage bonds. The road is part of the Missouri, Kansas & Texas system.

East Shore Terminal.—The proposal for an increase in the capital stock and for the creation of a second mortgage is to be acted upon at a special stockholders' meeting to be held at Charleston, S. C., Feb. 5. It is proposed to issue second mortgage bonds to the amount of \$300,000, and to increase the capital stock a similar amount.

East Tennessee, Virginia & Georgia.—The railroad reports gross earnings for December of \$765,400, a decrease of \$82,541 as compared with the same month of previous year, and net earnings of \$276,148, a decrease of \$66,776. For the six months ending Dec. 31, the gross earnings were \$4,402,003, a decrease of \$295,773 as compared with the corresponding period of previous year, and net earnings \$1,280,351, a decrease of \$87,570.

Herkimer, Newport & Poland.—The capital stock of the company was increased at a special meeting of the stockholders this week, in New York City, to \$500,000. The capital stock of the old narrow gauge company was \$250,000.

Illinois Central.—The following is the comparative statement of earnings for the six months ending Dec. 31, 1891 and 1890, December, 1891, being estimated:

	1891.	1890.	Inc. or Dec.
Gross operating receipts.....	\$10,068,438	\$9,320,262	I. \$748,176
Operating expenses.....	6,578,297	5,843,832	I. 734,465
Taxes.....	167,479	127,346	I. 39,733
Fixed charges.....	2,006,418	1,966,760	I. 9,658
Profits from traffic.....	\$1,016,644	\$1,052,324	D. \$35,680
Miscellaneous income.....	341,392	327,886	I. 13,506
Total profits.....	\$1,358,036	\$1,380,210	D. \$22,174
Surplus dividend fund.....	216,550	215,257	I. 1,292
Dividend (payable March 1, 1891, and March 1, 1892).....	1,125,400	1,350,000	D. 225,000
Surplus.....	\$449,595	\$245,467	I. \$204,128

International & Great Northern.—It is reported that an agreement had been virtually reached between the large bondholders of the railroad and the Missouri Pacific interest for the reorganization of the company, which is now in the control of receivers. Attempts have been made to effect a reorganization, but they have failed because of the difficulty of reconciling the views of the bondholders and the directors of the Missouri Pacific, which holds control of half the stock. The agreement now reached is said to provide for the payment of cash on half the coupons of the first mortgage bonds, the remainder to be paid in five per cent. interest bearing notes. The second mortgage bonds are to receive third mortgage bonds for past due interest, and the rate of interest on the seconds is to be $4\frac{1}{2}$ per cent. for six years and 5 per cent. thereafter.

Ohio & Mississippi.—The State Circuit Court at Cincinnati, O., has decided against the present board of directors in the suit brought to decide the legality of the trust vote cast at the recent annual election in favor of Messrs. McKim, Walsh and Fahnestock. The court declared the election of J. H. Smith, E. Whittaker, E. Howland and R. Green, and their recognition as directors to be illegal. The defendants represent the minority of the stockholders who are opposed to the lease to the Baltimore & Ohio on the terms recently published. The stock voted for the defendants was held in a trust representing the committee of English stockholders, who had agreed to the lease to the Baltimore & Ohio.

Oregon Pacific.—At the foreclosure sale at Corvallis, Or., Jan. 21, the road was sold for \$1,000,000 to the bondholders' committee. It is said that practically all of the bondholders have agreed to the plan of reorganization which provides for a first mortgage of \$18,000,000 at five per cent. to run 50 years and a second income mortgage bond for \$10,000,000. Holders of present bonds will get 50 per cent. in new first mortgage bonds and 50 per cent. in income bonds for their principal. The balance of the first mortgage bonds will be used for settling the floating debt and receivers' certificates.

Philadelphia & Reading.—The statement of earnings for December, the first month of the fiscal year, shows the following comparisons with 1890:

	1891.	1890.	Inc.
Gross receipts.....	\$1,881,522	\$1,686,111	\$195,411
Operating expenses.....	973,838	956,462	12,624
Profit in operating.....	\$907,684	\$699,649	\$208,035
Other receipts.....	39,990	33,706	6,283
Profit for month.....	\$947,674	\$733,355	\$214,290
Expenditures for permanent improvements.....	\$18,418	\$49,789	\$1,365
One-twelfth of fixed charges.....	625,000	611,769	13,231
Surplus.....	\$613,415	\$661,552	\$18,134
Surplus.....	\$304,330	\$71,801	\$232,433

The statement of the Philadelphia & Reading Coal & Iron Co. for December, 1891, shows gross receipts of \$1,784,422; gross expenses (including operating expenses, \$1,623,942; colliery improvements, \$74,302; permanent improvements, etc., \$13,764); of \$1,712,000; profit from mining, \$72,323. The surplus for the month is \$6,823.96, an increase of \$64,955.07 over December, 1890, when there was a deficit of \$58,132.

Richmond & West Point Terminal.—There is considerable discussion as to what form the reorganization plan of the Olcott committee will take. Chairman

Olcott of the committee says that he has no idea when the plan will be completed, and can give no information in regard to its general form. It is reported, however, that the plan has been agreed on so far that it can be stated that a new company, to be called the "The Great Southern Company," will take the place of the present corporation, that it will have a capital stock of about \$150,000,000, "and a consolidated mortgage heavy enough to provide for present needs and to take up existing underlying liens as they mature. It has not been decided yet whether the East Tennessee system will be included in the Great Southern Company or not. The prospects at present are that it will be released in all respects from the Richmond Terminal's control or that of its successor company, and will be operated by its present managers, as heretofore, as an independent system."

Western Maryland.—An ordinance was introduced in the Baltimore City Council Jan. 21 providing for the sale by the Finance Commissioners of the city's interest in the railroad to John H. Bryant, of New York, and his associates, for \$1,895,000. The ordinance is similar to the one offered last year. If deemed necessary, the Mayor shall request the legislature to pass an act to change the charter so as to enable the purchasers to choose a majority of the directors. The offer of \$1,875,000 for the city's interest has been renewed by General Bryant.

West Virginia Central & Pittsburgh.—A preliminary report of the operations of the road for the past year shows that the net revenue was \$310,159, against \$266,329 for the year previous, a gain of \$43,830. After paying all fixed charges the profits to the road were \$134,062. During the year there was expended for additional rolling stock \$62,272, but with the exception of this item and the amount paid for real estate and second track, all improvements have been charged to operating expenses, the latter being 59 per cent. of gross receipts. The general condition of the road has been improved during the year, progress made on second track and 24 miles of additional road built, connecting at Belington, W. Va., with the Baltimore & Ohio Railroad, and at Fairbance with the Pennsylvania Railroad, thus providing an outlet by these systems to the lakes and the Northwest by way of Pittsburgh.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, Jan. 27, 1892.

The Rock Island took an appeal from the decision of Chairman Finley fixing the road \$300 for maintaining an outside office in Chicago, noted in this column Jan. 22, and Messrs. E. A. Ford, A. J. Smith and J. F. Tucker were selected as arbitrators. The case has been heard and the arbitrators sustain the chairman.

An arbitration has also been had in the case decided against the Rock Island Nov. 30, respecting the sale of excursion tickets over its line by the Burlington, Cedar Rapids & Northern (noted in this column Dec. 4), and the arbitrators, Messrs. S. K. Hooper, O. W. Ruggles and E. L. Lomax, reverse the decision of the chairman on the ground that the intent of the agreement is not to hold a member criminally liable for a violation of its provisions by a connection, when the member has no knowledge prior to the act, but only to require that upon receipt of information of intention on the part of a connecting line to do an act in violation of agreement prompt measures shall be taken to prevent such action. In the present case the evidence showed that the Rock Island had no prior knowledge, and upon receipt of notice at once took all possible measures to restrain its connection.

In the case of the appeal of the same company from a decision of Chairman Finley declining to grant authority to pay increased commissions on seaboard immigrant business, the arbitrators, Messrs. Jas. Barker, C. P. Atmore and Jas. V. Mahoney reverse the decision so far as it relates to commissions on business to California points, on the ground that they find the preponderance of evidence proving beyond a reasonable doubt that excessive commissions are being paid in New York on this business. They do not touch upon the payment of commissions to other points. This action is taken under the agreement of the Western Passenger Association and does not affect the situation in the Transcontinental Association.

At the meeting of the General Managers' Association of Chicago, held the 22d inst., E. St. John was elected President, vice E. T. Jeffery, resigned. Among the subjects considered were: Free Storage and Free Handling of Freight; Division of Demurrage Charges with Lines Furnishing the Cars. Both matters were referred to special committees. Meetings will hereafter be held every 60 days and special meetings at the call of the chair.

A meeting of the committee on lake and rail differentials of the Central Traffic Association has been called for Feb. 3 to consider the question of proportionate rates from lake ports on traffic received from lake lines; also lake and rail differentials in general.

For the 14 months ending Dec. 31, 1891, the period during which the agreement among the northwestern lines has been in effect, 171,740 full and 7,217 half fare passengers have been transported between Chicago and St. Paul and Minneapolis, local and through, in both directions. Of these 51,000 were first class local, 42,077 first class through, 34,635 second class, 3,484 third class, 15,639 tourist, 15,903 special excursion, and 16,219 mileage. The percentages carried by the lines were as follows:

Chicago, Milwaukee & St. Paul.....	27.4
Chicago & Northwestern.....	30.3
Wisconsin Central.....	17.9
Chicago, St. Paul & Kansas City.....	14.8
Chicago Burlington & Northern.....	10.3
Albert Lea Route.....	9.3
	100.0

A proposition has been submitted to members to change the time limit in the Western Passenger Association on reduced rate tickets for the Republican National Convention from June 5, 6 and 7 to June 1, 2, 3 and 4.

Traffic Notes.

A cargo of flour (five train loads) for Galway, Ireland, was recently carried by rail from St. Louis to New Orleans over the Cairo Short Line and the Illinois Central.

The Grand Junction Milling Co., of Denver, has shipped the first carload of flour from that state for the famine-stricken people of Russia. The railroads carry it free to the Atlantic seaboard.

The Chicago, St. Paul & Kansas City has put on a through second-class sleeping car between St. Paul and

San Francisco via Kansas City, the Missouri Pacific, Denver & Rio Grande, etc.

The Colonial Express between Boston and Washington via the Harlem River steamboat transfer has Pullman cars. This is, we believe, the first line of Pullman cars to run over the New York, New Haven & Hartford.

The Board of Presidents of the Trunk Line Association formally voted last week to totally discontinue the Chicago & Alton boycott. The resolution reaffirms the determination not to pay commissions or permit other companies to do it within their territory.

The Mackey lines (Louisville, Evansville & St. Louis, Chicago & Eastern Illinois, etc.) have given notice that one-way local tickets will not be good over 24 hours after time of sale, and a similar rule will apply on returning portions of round-trip tickets. If not used before the time expires the company will redeem them at any time within five days.

No attention is paid to the statement that an agent of the Trans-Missouri Association is prowling around Denver. The fact is of no account as there is hardly a day in which there is not some detective inquiring into freight and passenger matters with a view of making a case against railroads that are surreptitiously cutting rates.—Denver paper.

As noted last week, the Transcontinental lines, at their recent meeting in New York were unable to agree upon the distribution of the amount to be paid to the Pacific Mail Steamship Co. for "space rental" for the ensuing three months; the arbitrators to which it was agreed to refer the matter are the Commissioners of the Western Traffic Association.

In the application to the United States Circuit Court for a decision in equity on import rates (which were the subject of a report by the Interstate Commerce Commission) the New York Board of Trade and Transportation has been joined by the Interstate Commerce Commission, and the defendant is the Texas & Pacific road.

The Secretary of Agriculture has notified the railroads of certain extra precautions against splenic fever among cattle which must be observed in shipments from most of the southern states and certain other territory, the limits of which are named. Exceptions are made to admit of the shipment of cattle under certain restrictions from Texas to Colorado, Wyoming and Montana for grazing purposes.

An agreement has been reached between lines interested in traffic from the seaboard via Virginia and Georgia ports to Missouri River territory to advance rates Feb. 1 from all North Atlantic seaboard territory to Memphis, Tenn., East St. Louis, Ill., and Mississippi River crossings north of there, on business destined to the Missouri River, to not less than the following differentials below the established all-rail rates from the same North Atlantic ports to East St. Louis:

Classes.....	1	2	3	4	5	6
Cents.....	10	8	6	4	4	3

The Missouri Pacific has notified the President of the Advisory Board of the Western Traffic Association that his suggestion to postpone the discussion of the complaints of that road, about its competitors' rate cutting, until the April meeting, will be acquiesced in. The April meeting under the rules will be held at Chicago, but, judging from past experience, there is little likelihood of a quorum being obtained for a meeting in that city, which will necessitate the calling of a special meeting in New York. An official of the Atchison road says that the charges of rate cutting made against that road by the Missouri Pacific were built on a very flimsy foundation. They are based on the fact that nine months ago an emergency rate on sugar was established by agreement of three transcontinental lines, the Southern Pacific, the Atchison and the Union Pacific. "To be sure, they did not obtain the authority of the Commissioners to make the rate, but it was a matter in which none of the other roads was interested and no objection was raised. But it seems that the Union Pacific failed to get any of the sugar. The Southern Pacific and the Atchison got it all, and now they are accused of violating the Western Traffic Association agreement in making the rate without proper authority. The case is not similar to that of the Missouri Pacific, which led to the discharge of Traffic Manager Leeds. Technically, perhaps, we violated the agreement, but, nobody was harmed or could be harmed by our action."

General Baggage Agents.

The annual convention of the National Association of General Baggage Agents was held last week in Cincinnati. The question of checking peddlers' packs, referred to the baggage agents by the Western Passenger Association, was placed in the hands of the following special committee: Messrs. McWade, Martin, Fuller, Crabtree and Walsh. By a unanimous vote the name of the organization was changed to the "American Association of General Baggage Agents." A committee of seven was appointed to investigate the matter of concealed losses, consider the rules of the association applying to the same, and report upon some method of improving the present system of settling such claims.

Eastbound Shipments.

The shipments of eastbound freight from Chicago by all the lines for the week ending Jan. 23 amounted to 105,486 tons, against 119,086 tons during the preceding week, a decrease of 13,600 tons, and against 81,661 tons during the corresponding week of 1891, an increase of 23,825 tons. The proportions carried by each road were:

Roads.	Wk. to Jan. 21		Wk. to Jan. 16.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	17,062	16.7	16,298	13.7
Wabash.....	6,602	6.2	6,789	6.7
Lake Shore & Michigan South.....	18,37	18.0	22,784	19.1
Pitts., Ft. Wayne & Chicago.....	11,765	11.2	18,113	15.5
Pitts., Cin., Chicago & St. L.....	11,806	11.2	13,130	11.9
Baltimore & Ohio.....	8,716	8.3	7,955	6.7
Chicago & Grand Trunk.....	10,725	10.2	11,015	9.3
New York, Chic. & St. Louis.....	9,094	8.5	12,176	10.1
Chicago & Erie.....	10,239	9.7	10,925	8.9
Total.....	105,486	100.0	119,086	100.0

Of the above shipments 10,256 tons were flour, 58,650 tons grain, 3,486 tons millstuffs, 6,745 tons cured meats, 10,155 tons dressed beef, 1,918 tons hides and 2,194 tons lumber. The three Vanderbilt lines carried 43.2 per cent. of all the business, and the two Pennsylvania lines 22.4 per cent.

GEO. WESTINGHOUSE, JR.,
President.T. W. WELSH,
Supt.JOHN CALDWELL,
Treasurer.W. W. CARD,
Secretary.H. H. WESTINGHOUSE,
General Manager.

THE WESTINGHOUSE AIR BRAKE COMPANY

PITTSBURGH, PA., U. S. A.,

MANUFACTURERS OF THE

WESTINGHOUSE AUTOMATIC BRAKE

The WESTINGHOUSE AUTOMATIC BRAKE is now in use on 22,000 engines and 270,000 cars. This includes (with plain brakes) 180,000 freight cars, which is about 18 PER CENT. of the Entire Freight Car Equipment of this country, and about 80 per cent. of these are engaged in interstate traffic, affording an opportunity of controlling the speed of trains by their use on railways over which they may pass. Orders have been received for 120,000 of the Improved Quick-Action Brakes since December, 1887.

The best results are obtained in freight train braking from having all the cars in a train fitted with power brakes, but several years' experience has proven conclusively that brakes can be successfully and profitably used on freight trains where but a portion of the cars are so equipped. Below is a graphical illustration of the progress made in the application of the Automatic Brake to freight cars since its inception.

Year.	No. per year.		Grand total.
1881	105		105
1882	1,085		1,190
1883	4,966		6,156
1884	15,051		21,207
1885	10,410		31,617
1886	8,946		40,563
1887	9,281		49,844
1888	27,696		77,540
1889	26,065		103,605
1890	50,502		154,107

154,107 freight cars fitted with the Westinghouse Automatic Brake, which is more than 15 per cent. of the Entire Freight Car Equipment of this country.

E. L. ADREON, Manager.

JOHN B. GRAY, Agent.

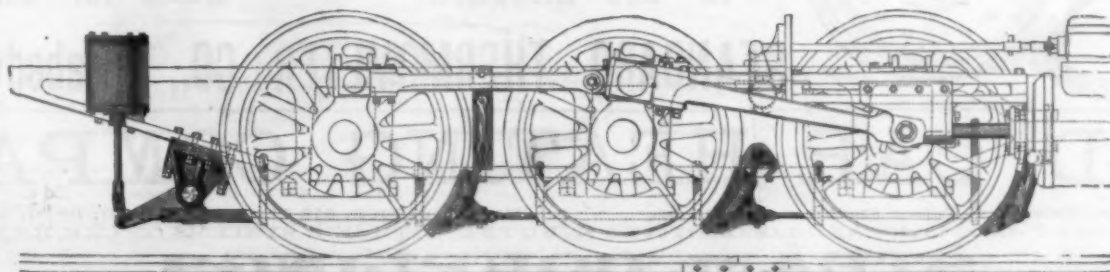
C. C. HIGHAM, General Supt.

THE AMERICAN BRAKE COMPANY.

NEW YORK OFFICE,
160 Broadway, JOHN B. GRAY, Agent.THE WESTINGHOUSE AIR BRAKE CO., Lessee,
MANUFACTURERS OFCHICAGO OFFICE,
GRAND PACIFIC HOTEL.

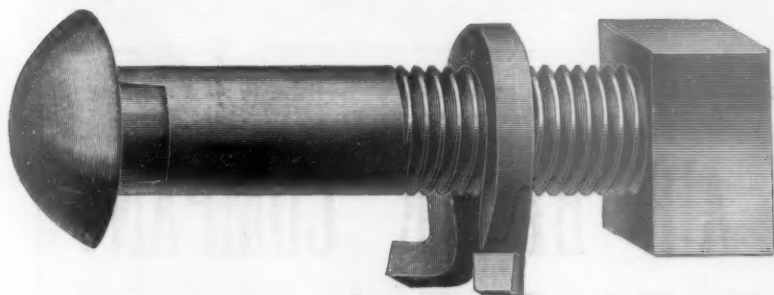
LOCOMOTIVE BRAKES.

General Offices and Shops, Second and Tyler Sts., ST. LOUIS, MO., U. S. A.



Standard Outside Equalized Pressure Brake, for two or more pairs of Drivers, furnished to operate with either STFAM, AIR or VACUUM.

THE "STANDARD" NUT LOCK



Manufactured under D. O. Ward's Patents by the
STANDARD NUT LOCK CO.,
 NOS. 236-248 BANK ST., NEWARK, N. J.
 SAMPLES FREE.

This nut lock is presented on its merits as the best and cheapest device for securing track joints.

It is a torsional loop made of good quality of tempered spring steel, having horizontally inclined foot pieces, which are curved inward, thereby greatly increasing the spring resistance and acting simultaneously; rests upon the base of angle bar, or underlying rail base in case of fish plate, preventing the loop portion from rotating and hammering down thread of bolt.

The nut lock for $\frac{1}{4}$ bolt made of $\frac{1}{4}$ in. square steel, standard pattern, yields a tension of 4,300 lbs. on the bolt, which is sufficient to reduce the wear of the bearing surfaces of the angle bars on the rails, imparting, as it does, a uniform bearing the entire length of the bar.

The "Standard" Nut Lock has sufficient elasticity to maintain a tight joint, which cannot be truthfully said of many light-weight single coil washers.

The "Standard" Nut Lock is, in its superficial form, similar to an annular coil twisted out of plain, i. e., the curved shoulders or ends of the loop proper are spread in the usual manner of spring coils, at which bearing points the locking friction is equal to that of the best single coil washer, and added to this it is terminated in *inwardly curved* extensions, which must apparently furnish additional short leverage spring force of a torsional character.

Distinctive Merits of the "Standard" Nut Lock, Condensed:

Fixedness of position—cannot rotate and hammer down threads of bolt.

Cannot get one end into elongated slot of angle-bar.

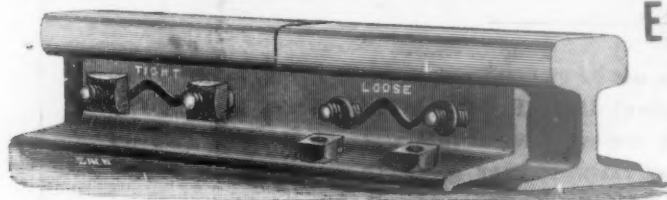
Unlike any permit only placed, double washer, the Standard is interchangeable regardless of distance between bolts.

Cannot be put on wrong side out, as the outward projection of the foot pieces would prevent the nut being turned up.

Has more spring power directly under the nut than any two ordinary coil nut locks.

Being fixed in position it offers double the locking friction of nut locks, which when in their *dead* "set" condition turn back with nut by the vibrative effect of passing train.

The "Standard" Nut Lock embodies the old principle of spring power improved by overcoming the objection to the double washer or nut lock, and covering the weak points of the single coil washer.



Excelsior Automatic Nut-Lock and Fish Plate Spring

These Nut Locks have been adopted by the New England Road-Masters, in Conventions held at Hartford, Conn., Oct. 19 and 20, 1887, and Boston, Mass., Aug. 15 and 16, 1888, as the best Nut Locks known.

Sample lots furnished for trial, free of expense, by forwarding the distance between centres of fish-plate bolts. Correspondence and orders solicited.

RUFFNER & DUNN,

Patentees and Sole Mfrs., SCHUYLKILL FALLS, Philadelphia, Pa.



Simple.
 Easily
 Applied.
 Very
 Effective.

THE NATIONAL LOCK WASHER

THE ONLY POSITIVE NUT LOCK IN COMBINATION WITH ELASTICITY.

Sixty Millions in Use in
 Railroad Track.



For Use on All Kinds and
 Classes of Work.

THE NATIONAL LOCK WASHER CO., Newark, N. J.

Made for all
 sizes of bolts.

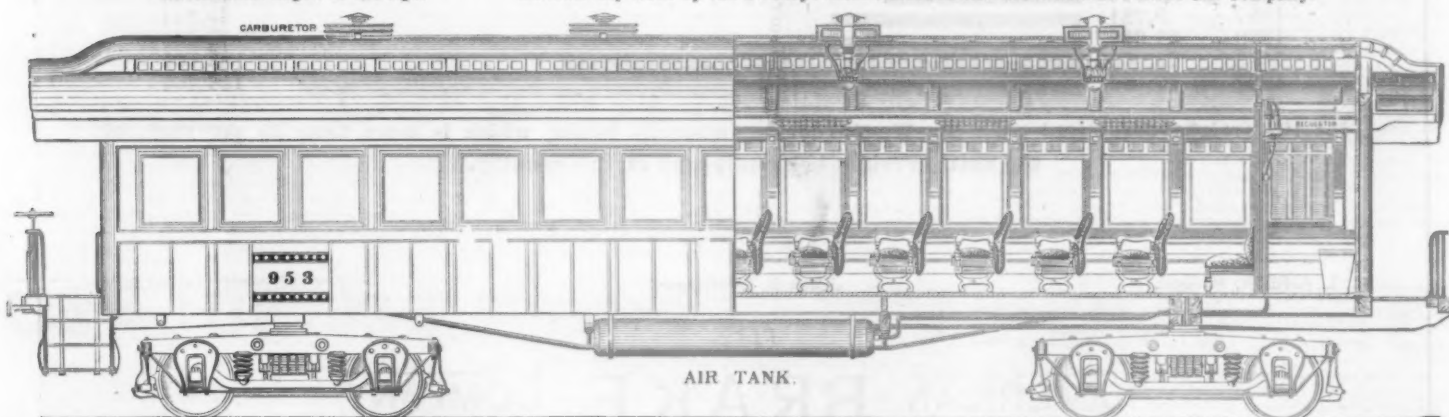
A trial is re-
 quested.

Samples free of
 expense.

THE FROST DRY CARBURETOR SYSTEM OF CAR LIGHTING.

The Greatest Light of the Age.

Extensively Used by the Pennsylvania Railroad and the Pullman Palace Car Company.

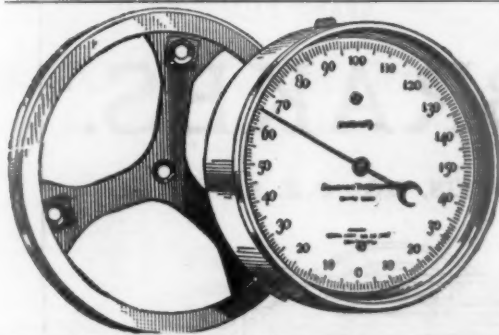


GENERAL ARRANGEMENT OF PARTS OF LIGHTING SYSTEM ON CAR

It cannot fail to attract the attention of practical railroad managers on account of its absolute safety, durability, simplicity, efficiency and its great economy. Each lamp gives 100 candle-power illumination. One hundred hours' continuous service from one charging of the carburetor.

THE RAILROAD LIGHTING & MFG. COMPANY.

Office, 700 and 701 Girard Building, Philadelphia, Pa., U. S. A.



THE STANDARD THERMOMETER

HAS BEEN ADOPTED BY THE

PENNSYLVANIA, BOSTON & ALBANY, FITCHBURG,
 and numerous other roads.

Is not Excelled.

Send for Circular.

STANDARD THERMOMETER CO., Peabody, Mass.

GOLD CAR HEATING COMPANY

NEW YORK ADDRESS: N. E. Corner Frankfort and Cliff Sts.

CHICAGO OFFICE: 652 The Hookery, E. H. GOLD, Representative.

UPWARD OF 4,000 CARS AND LOCOMOTIVES EQUIPPED WITH OUR SYSTEMS OF CAR HEATING.

STEAM COUPLINGS.

Gold's INTERCHANGEABLE, with Gravity Relief Trap.

UNIVERSAL,

to couple with SEWEL,

WESTINGHOUSE TYPE,

GIBBS,

We Own the Sole Rights under United States Patents to put Traps on Steam Couplings.

Send for Catalogue, etc.

A. W. SOPER, President.

ROBT' ANDREWS, Vice-President.

R. M. DIXON, Engineer.

C. L. GATELY, Secretary.

W. R. THOMAS, Treasurer.

The Safety

THE HEATING SYSTEMS.

BY HOT WATER CIRCULATION AND DIRECT STEAM WITH
REGULATING DEVICES.
RELIABLE AND UNIFORM HEAT.
ECONOMICAL AND RAPID CIRCULATION.
GIBBS' AUTOMATIC COUPLER OF WESTINGHOUSE TYPE,
ABSOLUTELY STEAM TIGHT.

THE LIGHTING SYSTEM.

THE CELEBRATED PINTSCH COMPRESSED OIL GAS METHOD
IN USE ON OVER 40,000 CARS IN EUROPE AND AMERICA.
THE BEST, MOST ECONOMICAL AND ONLY SAFE LIGHT FOR RAILROAD PURPOSES.
IN BRILLIANCY AND CLEANLINESS UNSURPASSED.
THIS SYSTEM HAS BEEN ADOPTED BY THE U. S. LIGHT-HOUSE BOARD FOR LIGHTING BUOYS.

Car Heating and Lighting Co.,

160 BROADWAY, NEW YORK.

W. M. MARTIN, President.

FRANK E. SHAW, Vice-President and Treasurer.

W. E. CANDEE, Secretary.

THE MARTIN ANTI-FIRE CAR HEATER

NOW IN USE ON MORE THAN 3,500 CARS AND ENGINES.

ADOPTED ON

Boston & Albany Railroad,
New York Central & Hudson River
Lake Shore & Michigan Southern,
Michigan Central,
Cleve., Col., Cin. & Ind. "Bee Line,"

Kings County Elevated,
Dunkirk, Allegheny Valley & Pittsburgh,
New York, Susquehanna & Western,
Cleveland & Canton,
West Shore,

Fall Brook Coal Co.,
Beech Creek Railroad,
Detroit, Lansing & Northern,
North. Cent. Div. of Pennsylvania System,
Union Pacific,

Buffalo, Rochester & Pittsburgh,
Providence & Worcester,
Long Island Railroad,
Elmira, Cortland & Northern R. R. Co.,
Lehigh Valley,

AND IN USE ON MANY OTHER RAILROADS.

MANUFACTURERS OF

Martin's Combination Car Heater, DeKalb Ventilating Car Window, Automatic Car Light Extinguisher,
Automatic Steam Trap, Reducing Pressure and other Valves Especially
Adapted to Steam Car Heating.

WHOLESALE DEALERS IN BRASS AND IRON STEAM FITTINGS, STEEL AND WROUGHT IRON PIPE

MARTIN ANTI-FIRE CAR HEATER CO., DUNKIRK. N. Y.

ALBANY, N. Y.

TRINITY PLACE.

New York City,
115 BROADWAY.

STEAM COUPLERS

AND
FIRE PROOF
HEATERS.

CONSOLIDATED

McElroy, Sewall, Westinghouse and other Patents.

CATALOGUES UPON APPLICATION.

Special Appliances and Extra Strong Fittings of Every Kind.

AUTOMATIC CONTROL OF HEAT.

CAR-HEATING CO.

CHICAGO,

616 PHENIX BLDG.

Canada,
COATCOOK, P. Q.

COMMINGLER,

DRUM,

AND
DIRECT STEAM
SYSTEMS.

THE CAR-HEATING PROBLEM SOLVED!

A Practical Method Produced.
Easily Handled by Train Men.
Controlled by a Single Valve.
Meets Every Requirement.

SEARLE'S STEAM HEATING

AND DOUBLE CIRCULATION OF

HOT WATER.

Any Water Circulating
System Can be Utilized.
The CONDENSED STEAM
AUTOMATICALLY Removed.

THE NATIONAL CAR-HEATING COMPANY, 436 ROOKERY, CHICAGO.

E. G. KENLY, General Manager.

EUGENE CARRINGTON, Gen. Supt.

STORED HEAT IN EARTHENWARE TUBES.

MORTON SAFETY HEATING COMPANY.

BEING USED ON THE FOLLOWING ROADS:

Canadian Railroads:

Intercolonial.

Grand Trunk.



United States Railroads:

Chicago, St. Paul, Min-
neapolis & Omaha.

Norfolk & Western.

Richmond, Fredericks-
burg & Potomac.

This system of heating is now in successful operation on the GRAND TRUNK and IN
TERCOLONIAL ROADS OF CANADA, NORFOLK & WESTERN, CHICAGO, ST. PAUL
MINNEAPOLIS & OMAHA, RICHMOND, FREDERICKSBURG & POTOMAC, and HOAN
OKE & SALEM ROADS, of the UNITED STATES.

ONE HEATING in the Coldest Climate keeps a train thoroughly comfortable for two
hours, and a pressure of steam afterward, of five minutes in each hour, is sufficient to main-
tain a uniform temperature of 70 degrees. No overheating and no cold cars. In case of acci-
dent there is absolutely NO DANGER OF FIRE, or injury from SCALDING, by escape of
steam.

Send for our new circular, showing winter tests and references. For full particulars of
cost of equipping trains address

MORTON SAFETY HEATING CO.,

N. Y. Office: Aldrich Court, 45 Broadway. Baltimore Office: 106 E. Saratoga Street.

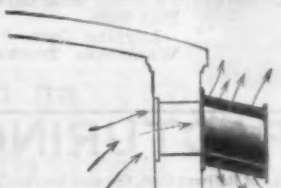
THE PANCOAST PATENT

CAR VENTILATORS.

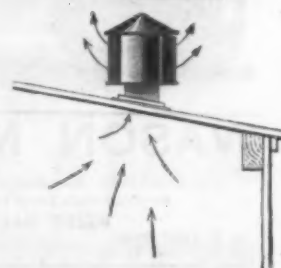
Strong exhausts from the impinge of the outside air,
and ABSOLUTELY ANTI-INGRESS.

The drooping form, Passenger
Car deck-side Ventilator.

The vertical form, Car-roof
Ventilator.



New,
Neat,
Noiseless,
Simple,
and
Scientific.



Guaranteed to EXHAUST MORE THAN ANY OTHER Auto-
matic Car Ventilators, and to be PERFECTLY STORM-
AND DIRT-PROOF.

R. M. Pancoast, C. E., Camden, N. J.

The Jackson & Woodin Mfg. Co.,

BERWICK, PA.



FREIGHT CARS, CAR WHEELS, CAST IRON WATER AND GAS PIPE, CASTINGS AND FORGINGS
C. R. WOODIN, Pres. C. H. ZEHRER, Vice Pres. and Genl. Manager.
Wm. F. LOWRY Treas. FRED. H. EATON, Secretary H. F. GLENN, Genl. Supt.

MIDDLETOWN CARWORKS

RAILWAY and MINE CARS.

Works and office on main line Pennsylvania and Philadelphia & Reading Railroads. Arthur King, Prop., Middletown, Pa.

KALAMAZOO R.R. VELOCIPEDE & CAR CO'S



Send for 1890 Illustrated Catalogue, showing Velocipedes, Hand Cars, etc., and special descriptive circular of our STEEL SURFACE CATTLE GUARD.

KALAMAZOO R. R. VELOCIPEDE & CAR CO., Kalamazoo, Mich.
PRICE, \$20. Weight ONLY 300 LBS.

SOUTHERN & PACIFIC REFRIGERATOR CAR CO.

CRITT. A. COX, President.

E. D. LEACH, Secy. and Treas.

BUILDER OF THE
SOUTHERN & PACIFIC
STANDARD REFRIGERATOR CAR.
—RIORDAN PATENTS.



The best Refrigerator Car now in use for Shippers of Dressed Meats, Fruits, Dairy Products and Brewers.

GENERAL OFFICES:
SUITE 1307,
CHAMBER OF COMMERCE,
CHICAGO.

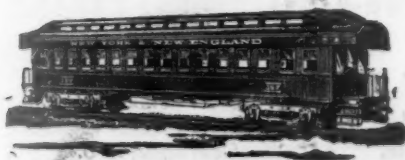
CORRESPONDENCE SOLICITED.

J. G. BRILL CO

PHILADELPHIA.

BUILDERS OF

Railway and Tramway Cars



THE ENSIGN MANUFACTURING COMPANY,
Manufacturers of **CARS** for Every Kind of
FREIGHT SERVICE.

Chilled Car Wheels of the Highest Grade only. Axles, Iron and Brass Castings. Capacity: 20 Cars and 400 Car Wheels Daily.

We respectfully solicit your inquiries and specifications.
F. E. CANDA, President. C. J. CANDA, Vice-President. J. W. SAVIN, Gen. Agent.
11 PINE ST., NEW YORK.
E. ENSIGN, Secretary and Treasurer.
HUNTINGTON, WEST VIRGINIA.

BLOOMSBURG CAR CO.

CARS FOR EXPORT
CONTRACTOR'S ROTARY
DUMP CARS.



G. M. LOCKARD.
J. K. LOCKARD.
R. W. OSWALD. Bloomsburg, Columbia Co., Pa.

YOUNGSTOWN CAR MFG. CO

Youngstown, Ohio.

RAILROAD FREIGHT CARS

L. E. COCHRAN, Pres. B. F. BOYD, Sec'y and Treas.
ANDREW MILLIKEN, Gen. Man.

W. H. GLASGOW, President.
H. B. DENKER, Vice-President & Gen. Man.

ST. CHARLES CAR CO

MANUFACTURERS OF CAR WHEELS, STREET AND MOTOR CARS.



PASSENGER COACHES, BAGGAGE & MAIL CARS

Box Cars,
Stock Cars,
Ore Cars,
Coal Cars,
Flat Cars,
Logging Cars,
Warehouse Trucks,



Refrigerator,
Excursion and
Caboose Cars,
Hand, Push and
Mining Cars,
Castings and
Forgings.

ST. CHARLES, MO.



WASON MANUFACTURING CO., SPRINGFIELD, MASS

Established 1845. Manufacturers of all descriptions of Railway Cars, Car and Locomotive Wheels, Frogs, Switches and Railway Castings. Employ none but Experienced Workmen, and have on hand a Large and Complete Stock of Seasoned Lumber, sufficient for several years' consumption. Special facilities for furnishing Sectional Work for Exportation.

DAILY CAPACITY, ONE PASSENGER AND SIX FREIGHT CARS. SHIPMENTS MADE FROM NEW YORK OR BOSTON.

G. C. FISK, Pres.
H. R. HYDE, Treas.

NEW WORKS BUILT 1872. P. O. ADDRESS, BRIGHTWOOD, MASS.

JAMES McMILLAN, Pres.
HUGH McMILLAN,
Vice-Pres.

W. J. McMILLAN,
Gen. Mgr.
JAS. MCGREGOR,
General Superintendent

MICHIGAN CAR COMPANY

RAILROAD FREIGHT AND REFRIGERATOR CARS.

Car Wheels and Castings, Axles, and Coupling Links and Pins.

Capacity, DETROIT MICH. 10 000 Cars per Annum.

W. K. ANDERSON, Treas.
JOSEPH TAYLOR, Secy.

R. E. PLUMB, Genl. Agt.
GEO. O. BEGG, F. A.



BRAKE



SHOES



CONGDON

Licensees of the CONSOLIDATED BRAKE SHOE CO.,

FOR OHIO AND WESTERN STATES: THE CONGDON BRAKE SHOE CO., Phenix Building, Chicago, Ill.

FOR OHIO AND EASTERN STATES: (CONGDON SHOES) RAMAPO WHEEL & FOUNDRY CO., Ramapo, New York.

FOR OHIO AND EASTERN STATES: (FLANGE SHOES) RAMAPO IRON WORKS, Hillburn, New York.

FOR SOUTHERN STATES: THE ROSS-MEEHAN BRAKE SHOE FOUNDRY CO., Chattanooga, Tenn.

Shoes should be ordered in accordance with the above allotment of territory.

HALE & KILBURN'S HIGH BACK TILTING CAR SEAT.

Over 35,000 sold since it was placed on the market (January, 1887), as follows:

Cars	Cars	Cars	Cars	Cars	Cars	Cars
N. Y. Central..... 181	Dul. S. Sh. & At. 20	N. Y., L. E. & W. 50	Illinois Central... 56	Louise. & Nashv. 30	Royal Blue, L'd. 24	
Balt. & Ohio..... 118	Richm. & Dany. 20	Cent. R. R. of N. J. 58	N. Y. & New Eng. 72	Old Colony R. R. 46	Long Island R. R. 23	
Lehigh Valley..... 66	Phila. & Reading 185	E. Tenn., Va. & Ga. 31				
Various other roads, 295 cars. Total number of cars, 1,275, running on 65 different railroads.						

NO CAR SEAT IN THE HISTORY OF RAILROADING CAN EQUAL ITS RECORD.

ALSO MANUFACTURERS OF

Parlor car chairs with detachable seat and back. Double reclining seats. Flexible steel top car seat springs. Rattan canvas lined seatings, etc. Write for our catalogue

Chicago Office:
422-3 Phenix Bldg.

THE HALE & KILBURN MFG. CO.

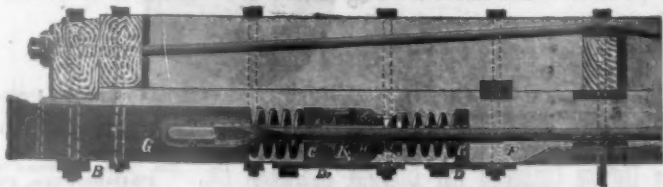
Offices: 48 & 50 North Sixth St.
PHILADELPHIA, PA.



J. P. COULTER, Pres. and Gen. Man. THOS. HIBBERT, Vice-Pres.

E. J. COULTER, Sec. and Treas.

AMERICAN DRAFT AND BUFFING APPARATUS



has demonstrated a saving of more than 90 per cent. to repairs to draft rigging. Successfully used on the Janney, Standard, Buckeye, Hinson and other couplers. We can give as reference over 70 first-class companies. No broken draft springs. No draft timbers or drawbars pulled out. No machine work required. Do not take any car for a pattern, but send to the company's office for drawings and full instructions. Address
THE AMERICAN CONTINUOUS DRAW BAR CO., Aurora, Ind.

DELAWARE CAR WORKS.

JACKSON & SHARP COMPANY.

Manufacturers of Passenger, Sleeping, City, Baggage and Freight Cars.

WILMINGTON, DEL.

Cable address "Jackson." Special attention given to Sectional Work for Exportation.

THE PARDEE CAR & MACHINE WORKS,

WATSONTOWN, PA.

Manufacture Mail, Baggage, Box, Gondola, Flat, Gravel, Ore, Coal, Mine and Hand Cars. Patent Turn-Tables and Centres for Wooden Turn-Tables, Car Castings, Railroad Forgings, Rolling-Mill Castings, Bridge Bolts and Castings.

We have in connection with our Car Works an extensive Foundry and Machine Shop, and are prepared to do a general Machine Business.

ARIO PARDEE, Proprietor.

S. B. MORGAN, Manager.

ROBERT GILLHAM, Pres. W. W. ALEXANDER, Vice-Pres. M. C. GILLHAM, Secy. & Treas.
E. R. GILL, General Manager and Electrician.

INDIVIDUAL TELEGRAPH CALL BELL SYSTEM

OF THE

Gill-Alexander Electric Manufacturing Co., Kansas City, Mo.

Patented and Patents Pending.

This new method of calling telegraph operators by a ringing bell is a valuable equipment for railway telegraph wires. Its use effects a saving of expense at many stations, and makes it possible to handle a larger volume of business with a fewer agents. All stations may be day and night offices with a single operator, and can be reached at any time with absolute certainty. It is of great value to the train dispatcher in the economical and safe handling of trains. The call requires but one sending, and is continued at the office desired without the use of the line circuit. The instrument works in the local circuit without interference with the sender and without extra battery.

The Union Pacific Railway has used our instruments since August, 1888, with absolute success, and other railroads are using them with equal satisfaction. It is the only practical individual Telegraph Call Bell yet invented.

We rent the instruments at a monthly rental and guarantee maintenance. Complete information after upon application. Circumstances are advised.

DE-OXIDIZED BRONZE JOURNAL BEARINGS.

UNPARALLELED MILEAGE RECORD.

OVER 225,000 MILES AND STILL RUNNING MAKES THEM the BEST and REALLY the CHEAPEST JOURNAL BEARINGS IN EXISTENCE.

GENUINE RABBIT AND ANTI-FRICTION METALS.

The DE-OXIDIZED METAL CO., Bridgeport, Conn.

THE E. S. CREELEY & CO.,

MANUFACTURERS, IMPORTERS AND DEALERS IN

Railway and Electrical Machinery and Supplies

OF EVERY DESCRIPTION.

Nos. 5 and 7 Day Street, New York.

South Baltimore Car Works

BALTIMORE, MD.

BUILDERS OF RAILROAD FREIGHT CARS

ERIE CAR WORKS, Limited.

Freight Cars of All Kinds.

Capacity, 20 CARS PER DAY.

ERIE, PA.

DAVENPORT & FAIRBAIRN.

Chilled Iron Car Wheels.

Capacity, 350 WHEELS PER DAY.

ERIE, PA.

THE ADDRESS PAINT AND COLOR COMPANY

MANUFACTURERS OF EVERY DESCRIPTION OF

RAILWAY AND MARINE PAINTS

15 CORTLANDT ST. NEW YORK

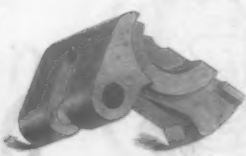
STANDARD COUPLER

(DOWLING TYPE).

THREE PARTS.



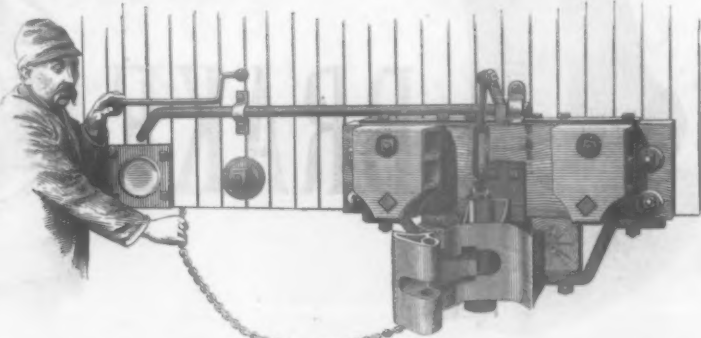
Drawhead, Malleable Iron.



Knuckle, Pressed Steel.



Pin, Drop Forged Steel.



With Chain Attachment for Opening Knuckle WHEN REQUIRED.

THE STANDARD CAR COUPLING CO., TROY, N. Y.

MAIN OFFICE: 45 Broadway, New York.

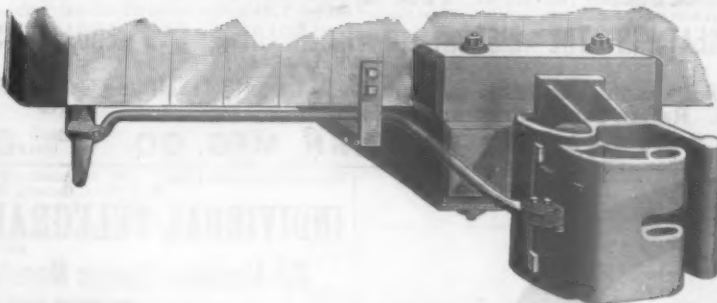
CHICAGO OFFICE: 1018 The Rookery.

W. A. ALEXANDER, President.
A. C. McCORD, Vice-President.

DREXEL COUPLER.

M. A. KILVERT, Treasurer.
D. W. McCORD, Secretary.

Knuckle Is Pulled Open from Side of Car by Continuation of Same Movement of Lever Which Raises the Lock.



Drawbar Cannot Fall on Track in Case of Breakage, as Connecting Rod Pulls Up Against Stirrup. Raises Lock and Allows Couplers to Separate.

THE ROOKERY, CHICAGO.

H. O. NOURSE, General Agent.

TROJAN CAR COUPLER.

M. C. B. TYPE.

THE STRONGEST AND THE ONLY SAFETY COUPLER.



The knuckle may be thrown open for coupling by the hand-rod at the side of the car, rendering it unnecessary for trainmen to go between the cars to open the knuckle. The action is positive, and not dependent on springs or gravity. The lock has a bearing of four square inches on the knuckle. N. O. Olsen, Engineer of Fairbanks & Co.'s testing department, says: "IT IS THE STRONGEST COUPLER NOW IN THE MARKET."

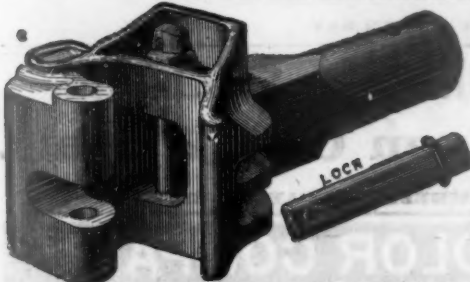
THE TROJAN CAR COUPLER CO.,

New York Office, 11 Pine street.

TROY, N. Y.

ST. LOUIS STEEL COUPLER,

M. C. B. STANDARD.



FREIGHT

COUPLERS.

PASSENGER

COUPLERS.

ST. LOUIS CAR COUPLER CO.,

Wm. V. WOLOOTZ, Pres.

St. Louis, Mo.
HENRY O'HARA,
Vice-Pres. and Treas.

Geo. A. BARNHART, Sec'y.

THE SURVIVAL OF THE FITTEST.
Van Dorston Cushioned Car Coupling Equipment Co.
VAN DORSTON CUSHIONED CAR COUPLER.

M. C. B. TYPE.

Lightest, Strongest and Best. Automatic Self-Opening and Self-Adjusting. Insures Safety to Trainmen. Independent Double-Acting Gravity Lock. No Slack Required to Uncouple.



Also the Van Dorston Single, Double and Automatic-Acting Cushioned Draught Gear. Seventy-five per cent. reduction in shocks on the part of the couplers and car bodies, and consequent great economy in repairs. Increase in yard room of from 12 to 18 cars per 1,000. Correspondence respectfully solicited.

Van Dorston Cushioned Car Coupling Equipment Co., No. 305 Walnut St., Philadelphia, Pa.
H. HAMILTON, Superintendent. EDWARD H. JOHNSTON, President.

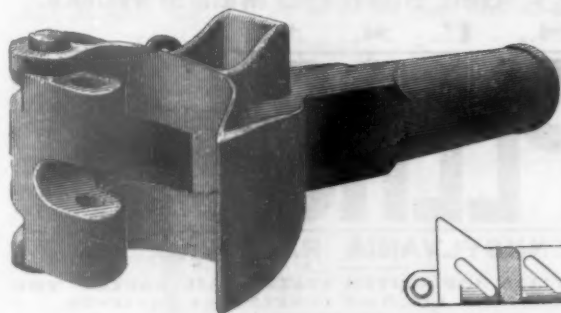


New Era Grader, Ditcher and Railroad Builder.

In building railroads makes cuts or fills embankments for 2 cents per cubic yard, moving 1,000 to 1,500 cubic yards in 10 hours with six teams and three men. Loads 600 to 800 wagons 1 1/4 yds. in same time at a cost of 2 1/2 cents each. Builds country roads at the rate of one mile in three days. We also make the Austin-Reversible Road Machine, Buck Scraper, Wheel and Drag Scrapers, Continuous Flows, and Trench Scrapers. Send for catalogue.

F. C. AUSTIN MFG. CO., Chicago, Ill.

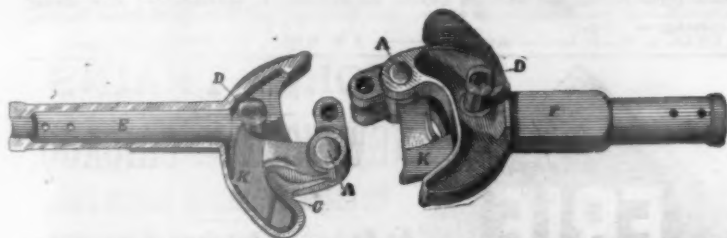
Automatic Interchangeable Car Coupling Company,
[**CALIFORNIA COUPLER,**]



Solid Steel
OR
Malleable
Iron,
WITH
Steel Knuckle.
Simplest,
Strongest,
Best.

F. L. WELLS, General Agent,
116 South Clinton St., Chicago, Ill. (Home Office, San Francisco, Cal.)

SMILLIE DOUBLE LOCK COUPLER.



Direct drop of full sized pin makes a double lock formed by draw bar at "C" and Pin "D." Equally strong if pivot pin "A" is lost. Should pin be lost, use any link—no chains being required. The strongest Knuckle and Coupler known. Cannot be unlocked by any jolt of the cars. Couples with all M. C. B. types. The locking pin drops behind the step on rear of Knuckle "K" and keeps the knuckle always open when cars are separated. Removing the pivot pins, 33 loaded gondola cars were drawn from Paterson, N. J., to West End (18 miles), the pull being entirely on the DOUBLE LOCK.

The drawbar is Malleable Iron. The Knuckle Pivot and Locking Pins steel.
THE SMILLIE COUPLER & MFG. CO.,
52 Broadway, New York. Works, 91 Clay St., Newark, N. J.

M. C. B. Standard
Automatic Freight Car Coupler.

New York Office: Chicago Office:
120 BROADWAY. 941 THE ROOKERY.

Gould
Coupler Co.

Buffalo Office and Works,
AUSTIN ST.

Locomotive and Car Axles,
Coupling
Links and Pins.

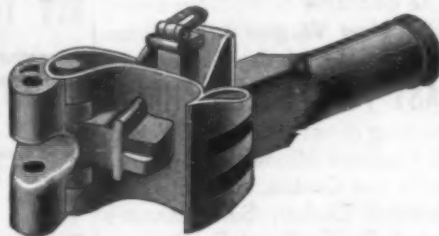
M. C. B. Passenger Coupler.
Used in Place of Miller Hook Without
Change in Platform.

Gould Continuous
Platform and Buffer.
Gould Vestibule.

THURMOND CAR COUPLING COMPANY.

M. C. B. COUPLER for Freight, Passenger and Locomotive Tender Service.
Special carrying irons, rod brackets and coupling pins. S. L. OWNERS of Flange and
Groove method of interlocking knuckle and drawhead, taking strain from Pivot Pin.

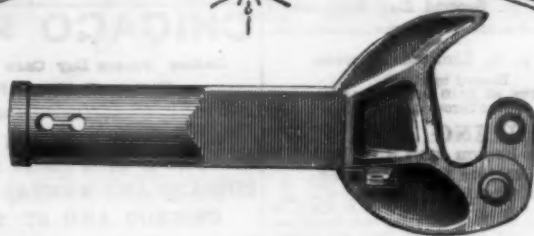
Tested to 150,240
lbs. tensile strain,
without using pivot
pin, on Fairbanks'
testing machine
April 20, 1891.



Address
E. RAGAN, Pres.

80 Broadway, New York.
T. W. GETMAN, Gen. Mgr. T. L. McKEEN, Supt.

THE JANNEY FREIGHT CAR COUPLER



THE Mc CONWAY & TORLEY Co.
W. Mc CONWAY.

© PRESIDENT. ©

48th St. & A. V. R. R. PITTSBURGH, PA.

Agents & Manufacturers For

THE JANNEY-HIEN COMPANY.

W. M. BARNUM, PRESIDENT.

W. Mc CONWAY, VICE PRES'T.

LIMEROCK,
CONN.

PITTSBURGH,
PENNA.

KELSEY RAILROAD SIGNAL COMPANY.

A. G. HILL, Treas. and Gen. Man.

F. N. KELSEY, Gen. Supt. and Man. of Works.

Works, FLORENCE, MASS., U. S. A.

PASSENGER,
FREIGHT,
TENDER.

HINSON COUPLERS

The
Hinson Car Coupler Co.,
518 Rookery, Chicago.
65 Boreel Bldg., N. Y.



OVER 7,000 MILES

Of steel track in Illinois, Iowa, Wisconsin, Michigan, Minnesota, Nebraska, Dakota and Wyoming, penetrates the Agricultural, Mining and Commercial Centres of the

WEST and NORTHWEST

The Unrivalled Equipment of the Line embraces Sumptuous Dining Cars, New Wagner and Pullman Sleepers, Supurb day Coaches and

FAST VESTIBULED TRAINS

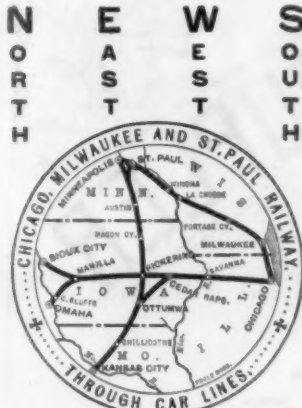
Running direct between Chicago, St. Paul and Minneapolis, Council Bluffs and Omaha, connecting for Portland, Denver, San Francisco and all Pacific Coast Points.

ONLY LINE TO THE BLACK HILLS

For Tickets, Rates, Maps, Time Tables and full information, apply to any Ticket Agent or address the Gen'l Passenger Agent, Chicago, Ill.

J. M. WHITMAN, E. G. WICKER, W. A. THYAU.

General Man. Traffic Man. G. P. & P. A.



GEO. H. HEAFFORD, General Passenger Agent.

J. H. HILAND, General Freight Agent.

CHICAGO, ILL.



between CHICAGO and
New York, Boston and the West

NEW YORK & NEW ENGLAND R. R.

New York and Boston Trains

Leave either city.....12:00 m. *3:00 p. m.
Arr. at termini.....6:30 p. m. *9:00 p. m.

TICKET OFFICES:

Grand Central Station, New York; 322 Washington Street, Boston.

*3:00 p. m.—The "White Train."—Runs daily, including Sundays.

Parlor and Dining Cars

BOSTON & ALBANY R. R.

SPRINGFIELD LINE

BOSTON AND NEW YORK

Through Train Service from either City.

9.00 a. m. Day Express,
Arrives at 3.30 p. m. Buffet Drawing-room Car.

11.00 a. m. Second Day Express.
Arrives at 5.30 p. m. Buffet Drawing-room Car.

4.00 p. m. Limited Express.
Heated by steam.
Daily, arrives at 10.00 p. m. Drawing-room Car through, and

DINING CAR

Between Boston and Springfield.

Table d'Hôte Dinner Served:

Westward, 4.00 to 6.15 p. m.

Eastward, 7.30 to 9.30 p. m.

The 4.00 p. m. train are the only trains between New York and Boston that are heated by steam from the engine.

11.00 p. m. Night Express.

Daily. Sleeping Cars. Sleeping Cars open for occupation at 9.15 p. m. arrives in New York at 6.45 a. m., and at Boston at 6.15 a. m.

A. S. HANSON,

Gen. Pass. Agent.

ILLINOIS CENTRAL RAILROAD.



Through Line of Free Reclining Chair Cars and Pullman Palace Sleepers between Chicago and St. Louis. Direct Connection in Union Depot for all points diverging

The SHORTEST ROUTE from CHICAGO to CAIRO, MEMPHIS and N. W. ORLEANS, making DIRECT CONNECTION for LITTLE ROCK, HOT SPRINGS, FT. WORTH and ALL POINTS in ARKANSAS and TEXAS; also for NASHVILLE, CHATTANOOGA, VICKSBURG, MOBILE, and ALL POINTS SOUTH and SOUTHEAST.

Through Train of Free Reclining Chair Cars and Pullman Palace Sleepers between Chicago and Springfield.

The SHORTEST and MOST DIRECT ROUTE from CHICAGO to ROCKFORD, DUBUQUE, WATERLOO, CEDAR FALLS, SIOUX CITY, SHELTON, ROCK RAPIDS and SIOUX FALLS, making DIRECT CONNECTION at SIOUX CITY with UNION PACIFIC RAILWAY for ALL POINTS in NEBRASKA, COLORADO, UTAH, WYOMING and THE PACIFIC OCEAN.

For Tickets, Rates and all information apply to any Coupon Ticket Agent in the United States or Canada, or address

T. J. HUDSON, Traffic Manager.

A. H. HANSON, General Passenger Agent.

General Freight Department.

THROUGH LINE WITHOUT TRANSFER OF FREIGHT

To principal points in Illinois, the West and Northwest; also to New Orleans, Memphis and points in the South, Southeast, Texas and Mexico.

HORACE TUCKER, General Freight Agent,
Chicago, Ill.

PENNSYLVANIA RAILROAD.

GREAT TRUNK LINE AND UNITED STATES MAIL ROUTE. THE BEST CONSTRUCTED AND MOST COMPLETELY EQUIPPED RAILWAY IN AMERICA.

Connecting all the principal cities on the Atlantic coast with those in the Mississippi Valley and on the Great Lakes. Through trains with Pullman Vestibule Cars attached, between New York, Philadelphia, Washington and Baltimore and Chicago, St. Louis, Cincinnati and Louisville.

Baggage Checked to Destination. Fare always as low as by any other route. For tickets, palace and parlor car accommodations, and all desired information, apply at the office of the company: No. 205 Washington street, Boston; No. 1 Astor House, Nos. 425, 449 and 914 Broadway, and Desbrosses and Cortlandt street, New York; Nos. 838 and 1348 Chestnut street, and Broad Street Station, Philadelphia; N. E. corner Baltimore and Calvert streets, Union Station and Northern Central Railway Station, Baltimore; N. E. corner thirteenth street and Pennsylvania avenue, and Baltimore and Potomac Railroad Station, Washington City.

CHAS. E. PUGH, General Manager.

J. R. WOOD, General Passenger Agent.

SOLID TRAINS

—BETWEEN—

NEW YORK AND CHICAGO,

Via Chautauqua Lake or Niagara Falls.

An Enchanting Panorama of Mountains, Forests and Streams.

PULLMAN CARS

Between New York and Rochester, Buffalo, Niagara Falls, Toronto, Chautauqua Lake, Cleveland, Cincinnati and Chicago.

D. I. ROBERTS, Gen'l Pass. Agt.



Short and Direct Through Car Line

BETWEEN

CINCINNATI, INDIANAPOLIS AND CHICAGO.



Private Compartment Buffet Sleeping Cars, Standard Wagner Palace Sleeping Cars and Elegant Reclining Chair Cars on Night Trains; Luxurious Parlor and Cafe Dining Cars on Day Trains.

THE SOUTHWESTERN LIMITED,

FROM ST. LOUIS, INDIANAPOLIS AND CINCINNATI TO NEW YORK AND BOSTON,

is the finest train in America, and provides the best and quickest service ever offered between the East and the West, landing passengers in the heart of New York City without ferry transfer.

OSCAR G. MURRAY, Traffic Manager, D. B. MARTIN, Gen. Pass. Agt., CINCINNATI, O.

CHICAGO & ALTON RAILROAD.

Ladies Palace Day Cars and Palace Reclining Chair Cars Free of Extra

Charge, Pullman Palace Buffet Compartment Sleeping Cars,

and Palace Dining Cars.

PULLMAN VESTIBULED TRAINS

Free of Extra Charge, and no Change of Cars of any Class Between

CHICAGO AND KANSAS CITY, CHICAGO AND DENVER

CHICAGO AND ST. LOUIS, and ST. LOUIS AND KANSAS CITY.

Pioneer Pullman Palace Sleeping Car, Palace Dining Car, and Free Palace Reclining Chair Car Line.

JAMES CHARLTON, General Passenger and Ticket Agent, 210 Dearborn Street, Corner Adams Street. CHICAGO, ILL.

NEW YORK CENTRAL & HUDSON RIVER R. R.

THE GREAT FOUR-TRACK TRUNK LINE OF AMERICA.

All through trains arrive at and depart from Grand Central Station, Fourth Ave. and 42d Street, New York, the very centre of the city.

THE DIRECT LINE BETWEEN NEW YORK AND NIAGARA FALLS

Wagner Palace Sleeping and Drawing-Room Cars on all through trains.

JOHN M. TOUCEY,

General Manager.

GEO. H. DANIELS,

General Passenger Agent.



4 DAILY TRAINS 4

ST. LOUIS TO KANSAS CITY. THE COLORADO SHORT LINE TO PUEBLO AND DENVER EQUIPPED WITH PULLMAN BUFFET SLEEPING CARS.

IRON MOUNTAIN ROUTE. 3 DAILY TRAINS 3.

To Texas and the Southwest. The Shortest and Quickest Line to the City of Mexico, with only one change at Laredo.

ONLY ONE CHANGE OF CARS ST. LOUIS TO SAN FRANCISCO.

S. H. H. CLARK, H. C. TOWNSEND,

1st V.-Pres. & Genl. Mgr. Genl. Pass. and Ticket Agent



THE FINEST ON EARTH.—The Cincinnati, Hamilton & Dayton, R.R. is the only line running Pullman's Perfect Vestibule Trains, with chair parlor, sleeping and dining-car service between Cincinnati, Indianapolis and Chicago, and is the only line running through reclining-chair cars between Cincinnati, Keokuk and Springfield, Ill.; and combination chair and sleeping-car Cincinnati to Peoria, Ill., and the ONLY DIRECT LINE between Cincinnati, Dayton, Lima, Toledo, Detroit, the Lake Regions and Canada. The road is one of the oldest in the State of Ohio and the only line entering Cincinnati over 25 miles of double track, and from its past record can more than assure its patrons speed, comfort and safety. Tickets on sale everywhere, and see that they read C., H. & D., either in or out of Cincinnati, Indianapolis or Toledo. E. O. MCCORMICK, Gen. Pass. and Tkt. Agent.

THE RAILROAD GAZETTE

has more Railroad Officers as subscribers and readers than all other railroad papers combined. Its advertising rates are no higher than those of papers having less than half its circulation.

LIDGERWOOD HOISTING ENGINES,



—ALSO—
ENGINES AND BOILER
COMBINED,

—SPECIALLY ADAPTED FOR—

Contractors, Bridge Building, Pile Driving,
 Dock Building, Excavating

AND

GENERAL RAILROAD PURPOSES.

300 STYLES AND SIZES.

OVER 8,000 IN USE.

LIDGERWOOD MFG. CO.,

96 LIBERTY STREET, NEW YORK,

197-203 Congress St., Boston; 34 and 36 West Monroe St., Chicago; 99 First Ave., Pittsburgh;
 610 N. 4th St., St. Louis; 5 and 7 N. First St., Portland, Ore.

Sales Agents; FRASER & CHALMERS, Salt Lake City, Utah, and Helena, Mont.

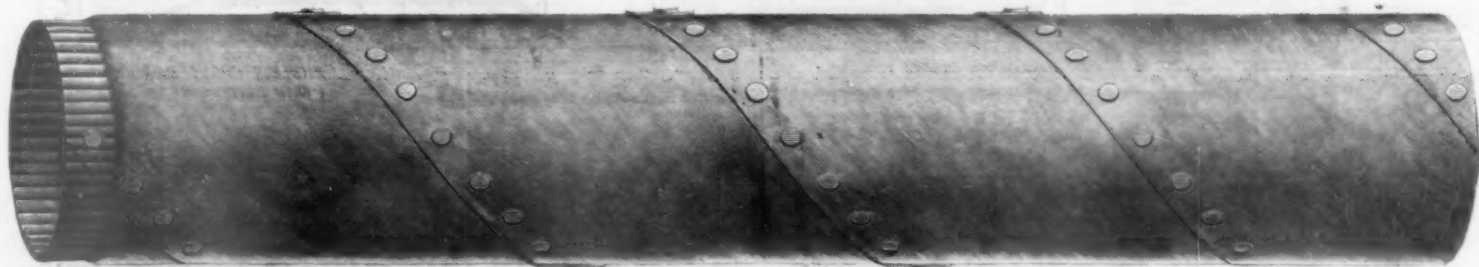
STEEL OR IRON SPIRAL RIVETED PIPE

3 to 24 Inches Diameter; 2 to 25 Feet Lengths.

TESTED TO FROM 150 TO 300 LBS. HYDROSTATIC PRESSURE.

—ALSO—

FITTINGS TO SUIT SERVICE. REQUIRED.



Unrivalled for Railroad Water Supply, Irrigating Purposes, Etc.,

AS HAS BEEN PROVED BY 14 YEARS' PRACTICAL EXPERIENCE.

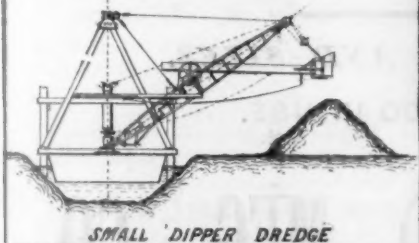
ABENDROTH & ROOT M'F'G CO.,

28 CLIFF STREET, NEW YORK.

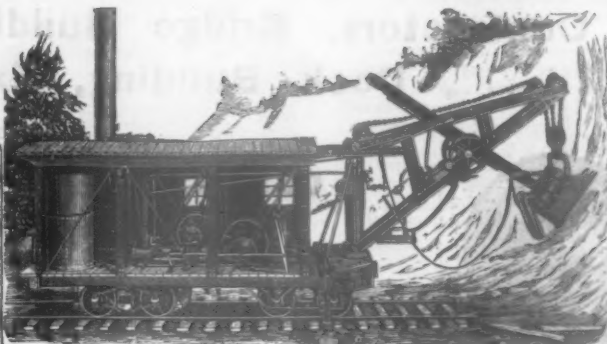
BUCYRUS STEAM SHOVEL AND DREDGE COMPANY

OFFICERS

Wm. Hamilton Harris, President.
Howard P. Eells, Vice-Prest. and Treas.
W.B. Crittenden, Manager.
A.B. Stetson, Superintendent.
A.W. Robinson, Engineer.
E.H. Hipple, Secretary.



SMALL 'DIPPER' DREDGE

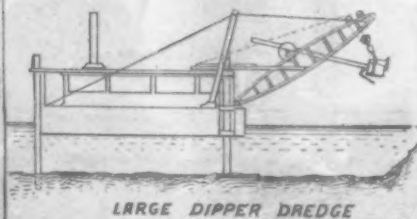


STANDARD STEAM SHOVEL

AGENCIES

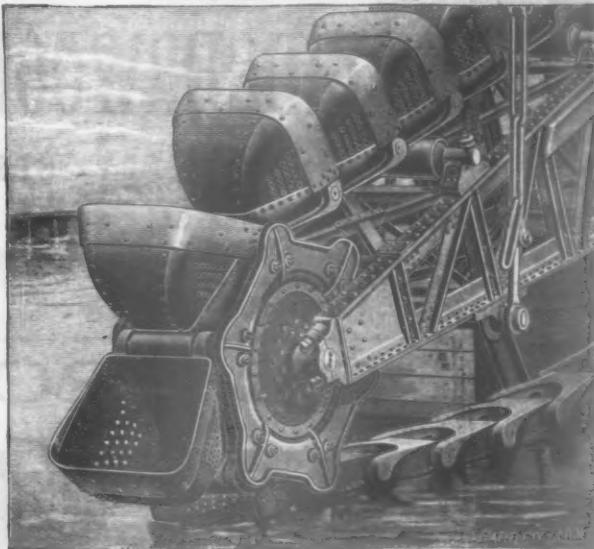
CHICAGO,
SAN FRANCISCO,
HOUSTON, TEX.
BROOKLYN, N. Y.
PORTLAND, ORE.

E.W. CRAMER, MANAGER
"The Rockery"
W.B. ISAACS,
286 Market St.
T.W. ANDERSON,
20 Main St.
C.R. KEARNS,
630 President St.
STAVEL & WALKER.



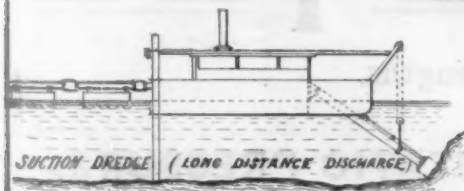
LARGE DIPPER DREDGE

STEAM SHOVELS
FOR
RAILROADS,
CONTRACTORS,
BRICKYARDS.
5 SIZES.
CAPACITIES, 200 TO 3000
CUBIC YARDS PER DAY.

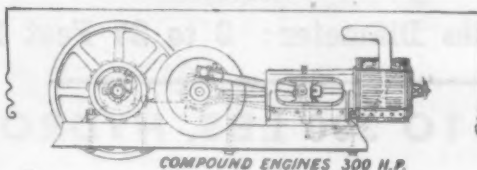


ENDLESS CHAIN DREDGE "THE RIGGING END"

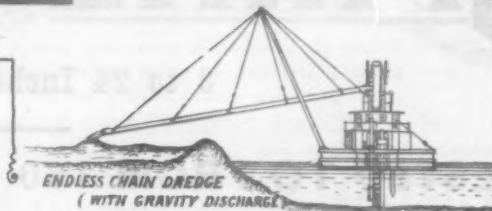
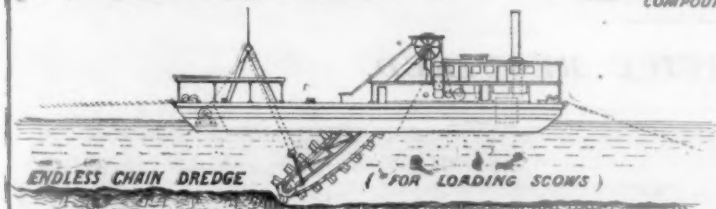
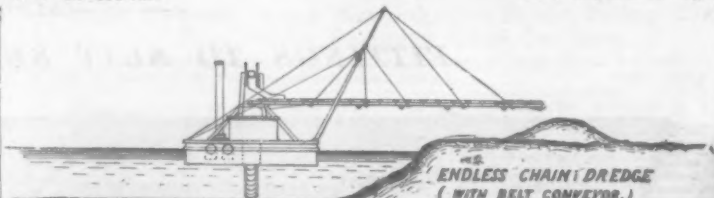
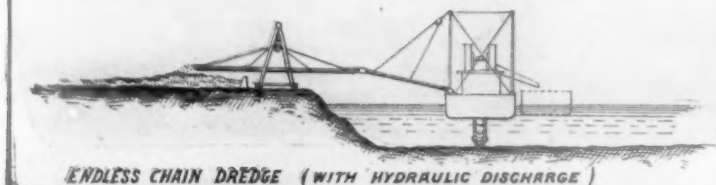
STEAM DREDGES
OF EVERY TYPE
Endless Chain, Clam Shell,
Dipper, Suction.
Capacities,
500 TO 10000 CUBIC YDS. PER DAY
FOR **RIVERS,**
HARBORS, CANALS,
DRAINAGE, IRRIGATION,
LAND RECLAMATION.



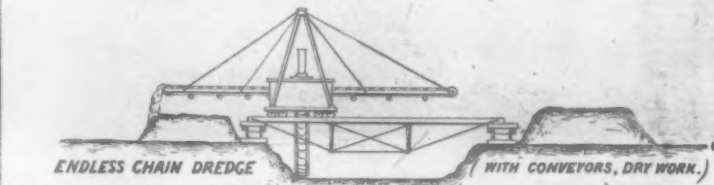
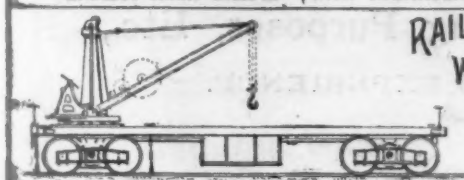
SUCTION DREDGE (LONG DISTANCE DISCHARGE)



COMPOUND ENGINES 300 H.P.

ENDLESS CHAIN DREDGE
(WITH GRAVITY DISCHARGE)ENDLESS CHAIN DREDGE
(FOR LOADING SCOWS)ENDLESS CHAIN DREDGE
(WITH BELT CONVEYOR.)

ENDLESS CHAIN DREDGE (WITH HYDRAULIC DISCHARGE)

ENDLESS CHAIN DREDGE
(WITH CONVEYORS, DRY WORK.)

**RAILROAD
WRECKING CARS**
CAPACITY
10 TO 50 TONS

BUCYRUS, OHIO,
U.S.A.

BARTLETT & CO. N.Y.

THE BALTIMORE CAR WHEEL COMPANY

MANUFACTURERS OF

CHILLED WHEELS OF ALL PATTERNS AND SIZES FOR EVERY SERVICE, AND WITH OR WITHOUT AXLES.
CAPACITY, 400 WHEELS PER DAY.

W. S. G. BAKER, *President and Treasurer.*
J. PAUL BAKER, *Secretary.*

OFFICE AND WORKS: Fulton Junction, Baltimore, Md.

COCKERILL'S WROUGHT IRON CENTRE

Spoke and Disc Steel Tired Wheels,

OF AMERICAN STANDARD.

For Locomotive Driving Wheels, Locomotive Tender and Truck Wheels and Passenger Car Wheels.



Fourteen years of constant service on the Pennsylvania R. R., and over 25 years of service on the most important roads of Europe is the record of our wheels.



Gibson Fastening.

Mansel Retaining Rings or Gibson Fastening

Adopted as Standard Wheel on some of the Principal Roads in this country. Apply for Catalogue.

CHAS. G. ECKSTEIN & CO., Sole Agents
32 Liberty St., New York.

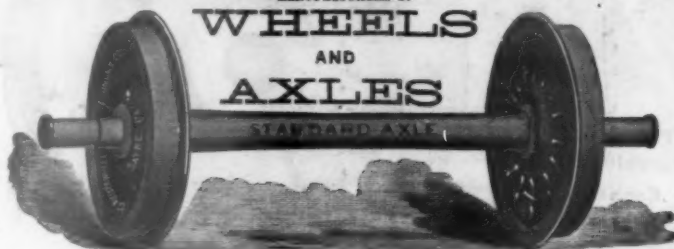
THE CAYUTA WHEEL AND FOUNDRY CO AND SAYRE STEAM FORCE

MANUFACTURERS OF

WHEELS

AND

AXLES

For Locomotives, Tenders, Passenger and Freight Cars.
RAILROAD CASTINGS AND HEAVY FORGINGS.

HOWARD ELMER, Pres.

F. E. LYFORD Treas.

M. C. CHAPMAN, Supt.

SAYRE PA.

THE WASHBURN CAR-WHEEL COMPANY

HARTFORD, CONN.

CRUCIBLE

STEEL-TIRED WHEELS,

For Parlor and Sleeping Cars,
Passenger Coaches, Locomotive
and Tender Trucks.

CAST-IRON CENTRES

WELDED TO

Hammered & Rolled Crucible Steel Tires.



THE KRUPP SYSTEM

OF

AMERICAN STANDARD

STEEL-TIRED WHEELS

CAST-STEEL WORKS

OF FRIED. KRUPP, Essen, Germany.

REPRESENTED BY

THOMAS PROSSER & SON

15 Gold Street, New York.



DETROIT CAR WHEEL CO.,

MANUFACTURERS OF

CAR WHEELS,

Railroad and Other Castings.

Foundries, Qd. Trunk and M. C. R. R. Junc., Springwells

Office No. 1 Newberry Building
DETROIT, MICH.

JAMES McMILLAN, Pres.

HUGH McMILLAN, Vice-Prest.

W. C. McMILLAN, Secy. and Gen. Man.

J. H. WHITING, Supt.

W. K. ANDERSON, Treas.

American Steel Wheel Co.,

JNO. C. PAUL, President.

SAM'L GARWOOD, Vice-Prest.

G. W. CUSHING, Superintendent.

W. W. WHITCOMB, Secretary and Treasurer.

—MANUFACTURERS OF—

Solid Steel Double Plate or Spoke Locomotive Truck, Tender, Passenger and Fast Freight Wheels, turned on tread and flange and balanced, on which we give a Mileage Guarantee.

Solid Steel Castings for Railroad Equipment generally, Miller Hooks, Buffers, Levers, Crossheads, Rockers etc., and Knuckles for repairing M. C. B. Drawheads.

This metal is acknowledged by R. R. officials to be especially adapted for Knuckles, owing to its superior strength and ductility.

Correspondence Solicited.

BOSTON OFFICE.

NEW YORK OFFICE.

New England Building 180 Summer St

Central Building, 143 Liberty St.

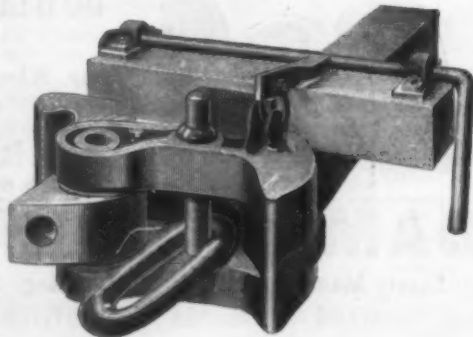
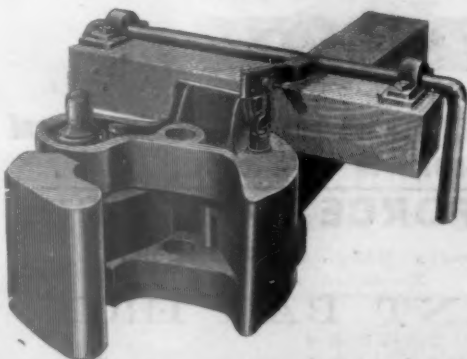
THE JERSEY CITY WHEEL FOUNDRY AND MACHINE WORKS HIGH GRADE CHILLED CAR WHEELS

ALL WHEELS GUARANTEED TO STAND 100,000 MILES

THE STILCKER & STROSLER AUTOMATIC CAR COUPLER

Is the Cheapest, Safest and Strongest Coupler, on account of its durability. The *only* Automatic Coupler that has a lateral swinging hook and couples with the link and pin proper, *and pulls direct from the centre at all times.*

This coupler has been in use on the Birmingham Division of the L. & N. R. R. five months without a break. We take pleasure in referring to the Supt. Motive Power, L. & N. R. R., as to its merits.



For any information, photographs, models or sample couplers address No. 310 FIFTH ST., LOUISVILLE, KY.



THE
**Standard
Steel Works,**
MANUFACTURERS OF
Locomotive and Car-Wheel
TIRES.

OFFICE: 220 SOUTH FOURTH ST
Philadelphia, Pa.

High Grade **J. H. BASS** MANUFACTURER OF
CHILLED CAR WHEELS
FOR CAR ENGINE TENDER AND TRUCKS
DRIVING WHEELS CYLINDERS
ROLLING MILL RAILROAD CASTINGS

CHILL AND SAND ROLLS AND INGOT MOLDS
OFFICE WASHINGTON COR. OF DEARBORN ST. * A SPECIALTY * WORKS CHICAGO ILL. * PRR. C.R.I. SHOPS

ESTABLISHED 1853 **BASS FOUNDRY AND MACHINE WORKS** INCORPORATED 1873
MANUFACTURERS OF
CHILLED IRON CAR WHEELS
FOR LOCOMOTIVES TENDERS PASSENGER AND FREIGHT CARS
Corliss Cap and Locomotive Axles
LOCOMOTIVE FRAMES
High Speed and other Engines Boilers Heavy Machinery Railroad Forgings Castings
J. H. BASS Pres. J. I. WHITE Secy. R. J. FISHER Treas.
FORT WAYNE IND.

J. H. BASS, Pres. J. I. WHITE, Secy. R. J. FISHER, Treas.
ST. LOUIS CAR WHEEL CO.
MANUFACTURERS OF ALL KINDS OF
CHILLED WHEELS OF ALL PATTERNS
FOR EVERY KIND OF Railroad Service.
SPECIAL FACILITIES FOR RAILROAD CASTINGS
ALL KINDS OF RAILROAD AND STREET CAR FURNISHINGS.
General Office AND WORKS, CABANNE ST. RAILROAD CROSSING, ST. LOUIS, MO.



BOWLER & COMPANY,
Nos. 10 to 24 Winter St., CLEVELAND, O.
MANUFACTURERS OF
Car Wheels of all Kinds and
Sizes, with or without
axles.
Railroad Building and Heavy Castings
A SPECIALTY.

DAMASCUS BRONZE

Lately Manufactured by the Westinghouse Machine Co.
THE PEERLESS METAL FOR LOCOMOTIVES AND CAR-BEARINGS
Guaranteed 30 per cent. more durable than any bearing metal in the market; also guaranteed
not to heat or cut. The metal is for sale either in ingots or castings. Solely manufactured by the
DAMASCUS BRONZE CO.,
PITTSBURGH PA.

LATROBE STEEL WORKS

MANUFACTURERS OF

TIRES

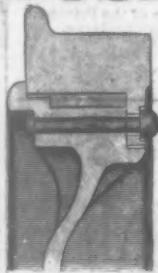
FOR LOCOMOTIVE AND CAR WHEELS.

Works and Main Office, Latrobe, Pa.

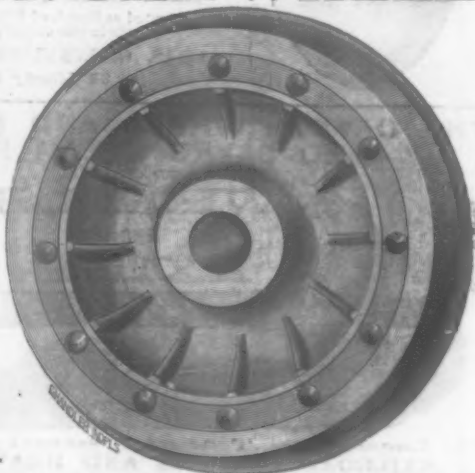
Branch Office, 251 S. 4th St., Philadelphia



CUSHION CAR WHEEL



RECORD 40,000 MILES.
1-16 INCH WEAR.



Simplicity.
Durability.
Economy.
Elasticity.
Safety.
Noiseless.

For Coaches, Locomotives and Tender Trucks on Elevated, Electric and Street Railroads.
Two pieces only. Centre never removed from axle. Tire renewed in any shop. Cushion
absorbs all vibrations or undue stress and thrusts. One half more mileage than any other
wheel made.

SEND FOR CIRCULAR.

CUSHION CAR WHEEL CO., (INDIANAPOLIS, IND., and GRAND PACIFIC HOTEL, CHICAGO.)

LOBDELL CAR WHEEL CO., WILMINGTON, DEL.
Established 1836.

Double Plate,
Single Plate
or
Hollow Spoke
WHEELS

FOR
Broad and Nar-
row-Gauge Cars
Engines and Ten-
ders.



Also
**OPEN AND
Solid Plate
STREET CAR
WHEELS**

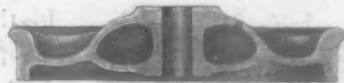
Either in the
Rough or Fitted
on Axles.

CAPACITY, 500 WHEELS PER DAY.

TAYLOR IRON & STEEL CO.

SUCCESSORS TO "THE TAYLOR IRON WORKS."

HIGH BRIDGE, NEW JERSEY, on line of C. R. R. of N. J.
NEW YORK OFFICE: ROOM 805 CENTRAL BUILDING, LIBERTY AND WEST STS.



MANUFACTURERS OF

Steel Tired Car Wheels, Chilled Iron Car Wheels, Car and
Locomotive Axles, Iron and Steel Forgings.

MICHIGAN FORCE & IRON CO.,

No. 1 Newberry Bldg., Detroit, Mich.

Manufacturers of

MERCHANT BAR IRON,

And all Kinds of

Car and Driving Axles, Links and Pins, Shafting and Forgings.

JAMES McMILLAN, Pres. HUGH McMILLAN Vice-Pres. W. C. McMILLAN, Gen. Man.
J. B. BAUGH, Gen. Supt. S. A. BAUGH, Supt. R. D. FIELD, Sec. W. A. ANDERSON, Treas.

THE FONTAINE CONTINUOUS RAIL CROSSING

(FOR DESCRIPTION SEE RAILROAD GAZETTE OF DEC. 18, 1891).

THE MOST ECONOMICAL. ABSOLUTE SAFETY.
HIGH RATE OF SPEED WITHOUT ANY JAR.

CHICAGO OFFICE:

Room 320, Home Insurance Office, 205 La Salle Street.

NEW YORK OFFICE:

Room 615, Mutual Life Building, 32 Nassau Street.

WORKS AND MAIN OFFICE:

FONTAINE CROSSING CO., DETROIT, MICH.
BARNUM & RICHARDSON MFG. CO.,

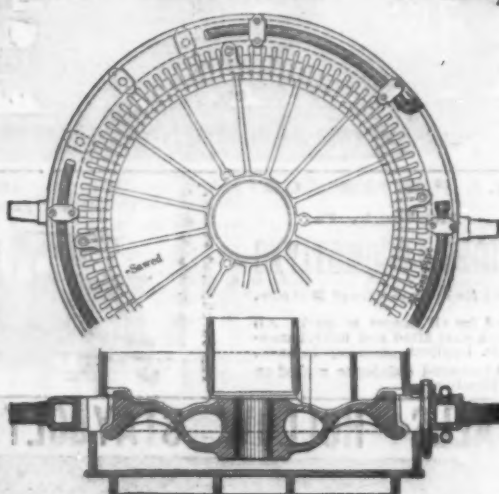
Office, 64 South Jefferson St., CHICAGO, ILL.



—MANUFACTURERS OF—
LOCOMOTIVE,
PASSENGER,
FREIGHT
—AND—
STREET CAR WHEELS,
IN THE

Barr Contracting Chills.
Salisbury Charcoal Pig Iron.
Street Railway Curves,
Crossings, Frogs and
Switches.

Machinery and Heavy Castings of
all descriptions. Wheels are made
perfectly cylindrical, uniform in
chill, and with treads ground.



RAMAPO IRON WORKS

HILLBURN ROCKLAND COUNTY, N. Y.

MANUFACTURERS OF

Switches, Automatic Safety Switch Stands, Yoked Frogs
Bolted Plate and Spring Rail Frogs, Automatic
Distant Signals Interlocked with Switches,
Crossings of Every Description.

LIGHT AND HEAVY CASTINGS AND GENERAL TRACK EQUIPMENT



Automatic Stand, Showing Position
of Parts while being Thrown
by Hand.



RAMAPO YOKED FROG."



Automatic Stand, Showing
Position of Parts while
being Thrown Au-
tomatically by
Train.

Ramapo Wheel & Foundry Company

MANUFACTURE

CHILLED IRON CAR WHEELS,

FROM SPECIAL QUALITY CHARCOAL IRON

FOR

Drawing Room and Sleeping Coaches, Lo-
comotives, Tenders and Passenger
and Freight Cars.

Congdon Brake Shoe.

Haul Journal Box.



BRAKE SHOES

OHIO & WESTERN STATES
MADE BY
CONGDON BRAKE SHOE CO.
CHICAGO, ILL.

OHIO & EASTERN STATES.

ROSS-MEEHAN SHOES

CONGDON SHOES

MADE BY

MADE BY

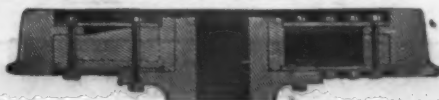
RAMAPO IRON WORKS

RAMAPO WHEEL & FOUNDRY CO.

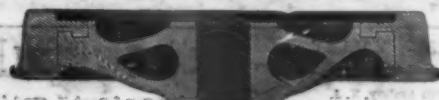
Snow's Rigid Steel-Tired Wheels,

WITH TIRES HAVING ANNULAR WEBS.

BOLTED—WITH WROUGHT-IRON PLATES, CAST-IRON CENTRE AND INTERCHANGEABLE HUB.



BOLTLESS—WITH CAST-IRON DOUBLE PLATE OR SPOKE CENTRE AND WEDGE-SHAPED RETAINING RING.



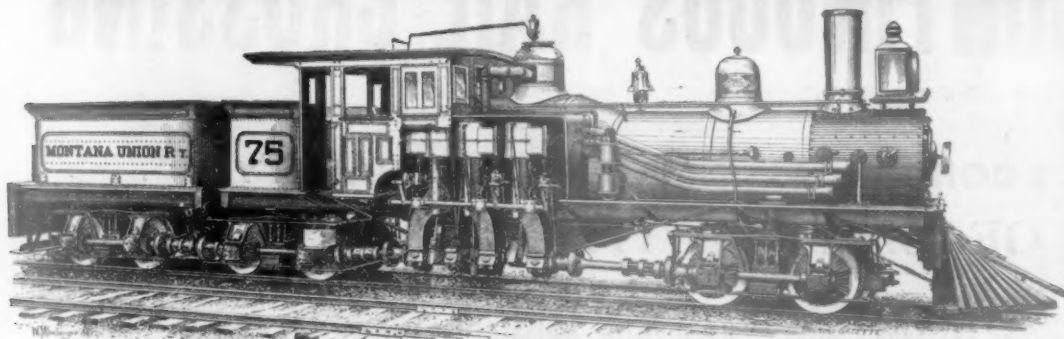
Both of these Wheels can be Retired in any Ordinary Machine Shop

OFFICE AND WORKS, RAMAPO, N. Y.

J. G. HENDRICKSON,
F. J. CLAMER,
Co-Partners.

AJAX BEARINGS DON'T GET HOT.

AJAX METAL CO.
Philadelphia, Pa.



LIMA MACHINE WORKS, LIMA, O., U. S. A.,

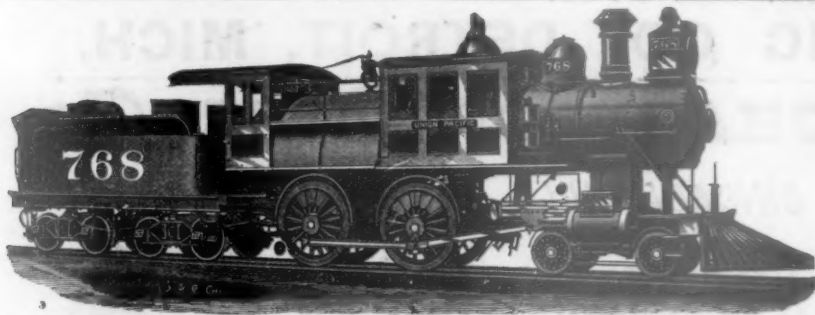
SOLE MANUFACTURERS OF THE

Shay Patent Locomotive Engines,

Built to weigh from 7 tons up to 30 tons on drivers and are especially adapted for service on roads where there are heavy grades and sharp curves. These locomotives are working successfully on grades of 9% per cent., and on curves of 100 feet radius. We also build

Standard Types of Light Locomotives,
Mining Cars of all kinds,
CAR WHEELS AND AXLES.

Write for Particulars.



WOOTEN LOCOMOTIVE

MECHANICAL AND ELECTRIC

INTERLOCKING AND BLOCK SIGNAL SYSTEMS.

Every Variety of Track Supplies. Heavy Tools.

MACHINISTS AND MANUFACTURERS.

THE WHARTON RAILROAD SWITCH CO.

125 South Fourth Street, Philadelphia, Pa.

H. K. PORTER & CO
Pittsburgh, Pa.

LIGHT LOCOMOTIVES

And Noiseless Street Motors.

And for all gauges of track. All work steel fitted and interchangeable. Duplicate parts kept in stock.

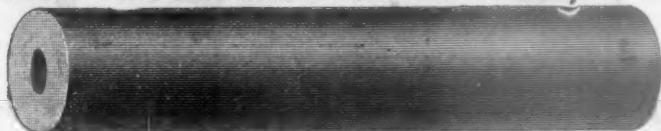
Illustrated Catalogue mailed on application.

This cut changed weekly.



FALLS HOLLOW STAYBOLT CO.,

CUYAHOGA
FALLS, O.



Manufacturers of PATENT MANDREL-ROLLED STAYBOLT IRON.

For use in Locomotive, Marine and Stationary Boilers.

The only Reliable Staybolt in the Market. Manufactured of Best Quality CHAMCOAL IRON. Made in all sizes, from 1/4 to 1 1/4 in. outside diameter, and with any size hole required, from 1/4 to 1 in. Samples and prices forwarded upon application.

When ordering new locomotives, do not fail to specify that our PATENT, MANDREL-ROLLED, HOLLOW STAYBOLT IRON must be used in their construction.

When the cost of drilling solid bolts is considered our HOLLOW BOLTS are cheaper and are superior. We guarantee our Staybolt Iron to have a tensile strength of not less than 50,000 lbs. per square inch, and an elongation of not less than 25 per cent.

IMPROVED LOCOMOTIVE STEAM GAUGE

SPRINGS MADE FROM

Special Seamless Drawn Tubing.

The ONLY Locomotive Steam Gauge made where the Movement, Springs and all Moving Parts are Detached from the Back of the Case.

Case Fitted with our Patent Elastic Packing to Prevent Dust and Moisture from Entering Gauge.

The Ashcroft Mfg. Co.

Factory, Bridgeport, Conn. Office, 111 Liberty Street, New York City.

PITTSBURGH FORGE AND IRON COMPANY
CALVIN WELLS, Pres. & Treas. MANUFACTURERS OF F. E. RICHARDSON, Socy.



AND



MERCHANT IRON,

Draw-Bars, Links and Pins, Follower Plates, Railroad Forgings, Arch Bars, Splice Bars, Track Bolts: Bridge Rods, with Plain or U-bolts Ends. All Sizes.

Office: Tenth Street, near Penn Avenue, Pittsburgh, Pa.

THE LEHIGH VALLEY CREOSOTING WORKS,

Works, Perth Amboy, N. J.
Office, Washington St., So. of Gap, Jersey City, N. J.
H. STANLEY GOODWIN, Pres. WALTER G. BESO, Engr.
H. COMER, Supt.

Lumber, Piling and Ties creosoted with DEAD OIL OF COAL TAR. Creosoted timber furnished. Capacity, 40,000 ft. B. M. per month. Cylinders 20 ft. long. Direct water and rail communication.

Machinery for Coaling Locomotives.

Before you forget it, send for Catalogue No. 7 to

C. W. HUNT CO.,

45 BROADWAY, NEW YORK.



Rhode Island Tool Company

Cold Punched Square and Hexagon Nuts.

(Chamfered and Trimmed with Drilled Holes.)

Finished Case-Hardened Hexagon Nuts.

Engineers' Steel Wrenches.

Machine Bolts.

Rough and Milled Studs.

Cap and Set Screws.

Turn Buckles.

Drop Forgings to Order.

Providence, Rhode Island.



FULLER BROTHERS & CO

139 GREENWICH STREET, NEW YORK,

SOLE AGENTS FOR

DOVER IRON CO. OF NEW JERSEY.

BOILER RIVETS, BRACE JAWS, STAY BOLT IRON

ALSO

NUTS, BOLTS AND WASHERS.

RICHARDSON & ALLEN-RICHARDSON BALANCED SLIDE VALVES.

NEW PATENT APRIL, 1891.

6,000 Locomotives Equipped. In use on 175 Railroads.

MANUFACTURED ONLY BY

M. C. HAMMETT,

SUCCESSOR TO

ESTATE OF F. W. RICHARDSON, TROY, N. Y.

THOMAS PROSSER & SON
15 Gold Street, New York.

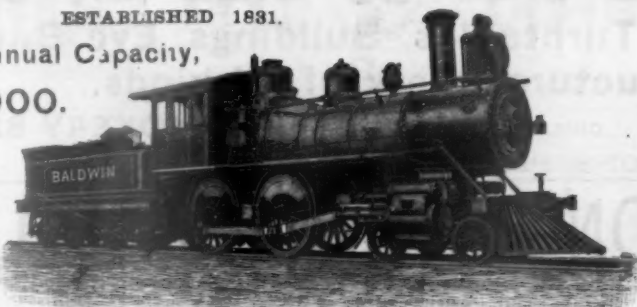
KRUPP'S STEEL TIRES

On Locomotive Driving Wheels.
GIVE THE BEST RESULTS
For Every Variety of Service.

BALDWIN LOCOMOTIVE WORKS,

ESTABLISHED 1831.

Annual Capacity,
1,000.



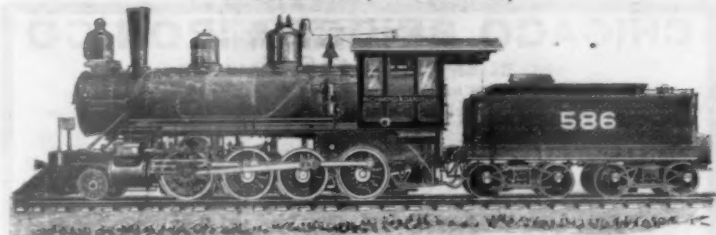
COMPOUND LOCOMOTIVES

And Locomotives adapted to every variety of service, and built accurately to standard gauges and templates. Like parts of different engines of same class perfectly interchangeable. Broad and Narrow Gauge Locomotives; Mine Locomotives by Steam or Compressed Air; Plantation Locomotives; Furnace Locomotives; Noiseless Motors for Street Railways, etc.

BURNHAM, WILLIAMS & CO., Proprietors, PHILADELPHIA, PA.

ESTABLISHED IN 1865.

Richmond Locomotive & Machine Works,
RICHMOND, VIRGINIA,



Builders of LOCOMOTIVES for all classes of service to standard designs and specifications.

DICKSON MANUFACTURING CO.

BUILDERS OF

Standard and Narrow-Gauge LOCOMOTIVES.

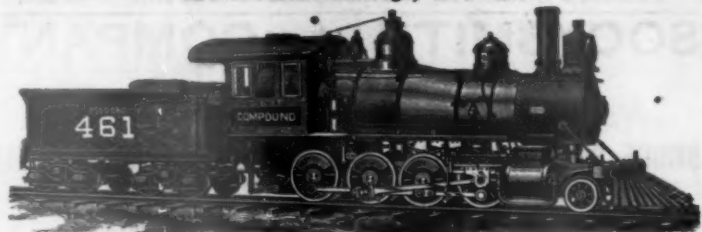
Scranton, Pa.

JAS. P. DICKSON, President
SIDNEY BROADBENT, Gen'l Supt.

WM. H. PERKINS, Secretary and Treasurer
JOHN DEVINE, Superintendent.

EDWARD ELLIS, Pres. WALTER McQUEEN, V-Pres. WM. D. ELLIS, Treas. ALBERT J. PITKIN, Supt.

SCHENECTADY LOCOMOTIVE WORKS,
Schenectady, N. Y.



LOCOMOTIVES OF STANDARD DESIGN FOR ALL CLASSES OF SERVICE
Or from Designs Furnished by Railroad Companies.
ANNUAL CAPACITY, 400.

HENDRICKS BROS.,

BELLEVILLE COPPER ROLLING MILLS,
49 CLIFF STREET, NEW YORK

MANUFACTURERS OF

BRAZIER,

BOLT,

SHEATHING.

COPPER

LOCOMO-

TIVE

FURNACE.

COPPER WIRE AND RIVETS.

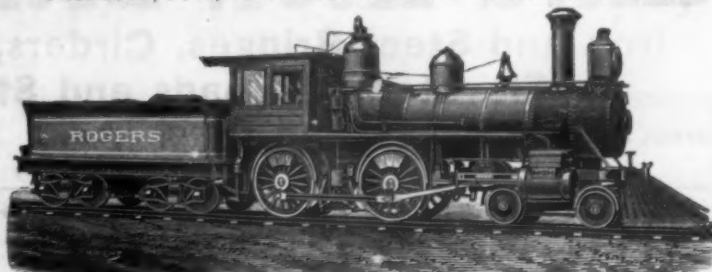
IMPORTERS AND DEALERS IN

INGOT COPPER, BLOCK TIN, SPELTER, LEAD,
ANTIMONY, BABBITT METAL, SOLDER, ETC.

COPPER

COPPER

ROGERS LOCOMOTIVE & MACHINE WORKS
PATERSON, N. J.; NEW YORK OFFICE, 44 EXCHANGE PLACE.



MANUFACTURERS OF

Locomotive Engines and Tenders and other Railroad Machinery

J. S. ROGERS, President.

JOHN HAYRON, Secretary.

PATERSON, N. J.

H. S. ROGERS, Treas.

44 Exchange Place, New York

REUBEN WELLS, Superintendent.

COMPOUND LOCOMOTIVES

PATENT AUTOMATIC INTERCEPTING AND STARTING VALVE.

The best results of COMPOUNDING LOCOMOTIVES have been obtained by the use of the

Worsdell, VonBorries & Lapage's System.

LICENSE to build Locomotives granted under the Patents of

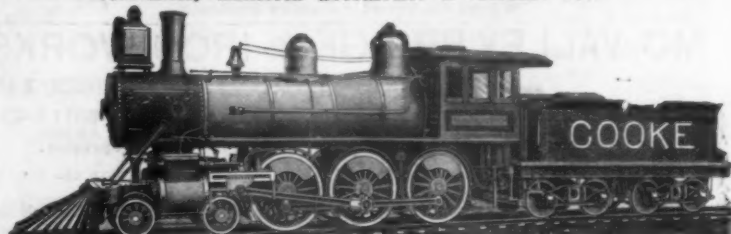
WORSDELL, VON BORRIES AND LAPAGE.

We are prepared to furnish Railroad Officers and Locomotive Builders with full particulars showing the Economy of the COMPOUND, together with working drawings, etc.

ADDRESS CORRESPONDENCE TO

G. L. FOWLER, 53 Broadway, NEW YORK.
TAITE & CARLTON, 63 Queen Victoria St., London, Eng.

COOKE LOCOMOTIVE & MACHINE CO. Paterson, N. J.
(Formerly Danforth Locomotive & Machine Co.)



JOHN S. COOKE, President & Gen. Man.
FRED. W. COOKE, Vice-President.
WM. BERDAN, Sec'y & Treas.

PATERSON, N. J.

New York Office,
45 BROADWAY,
H. A. ALLEN, Agent.

PITTSBURGH LOCOMOTIVE & CAR WORKS
PITTSBURGH, PA.



MANUFACTURERS OF

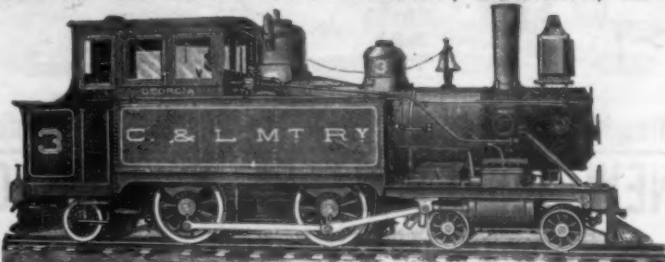
LOCOMOTIVE ENGINES FOR BROAD OR NARROW GAUGE ROADS

From standard designs, or according to specifications, to suit purchasers.

Tanks, Locomotive or Stationary Boilers Furnished at Short Notice.

D. A. STEWART, Pres't. D. A. WIGHTMAN, Sup't. WILSON MILLER, Sec. and Treas.

BROOKS LOCOMOTIVE WORKS, DUNKIRK, N. Y.



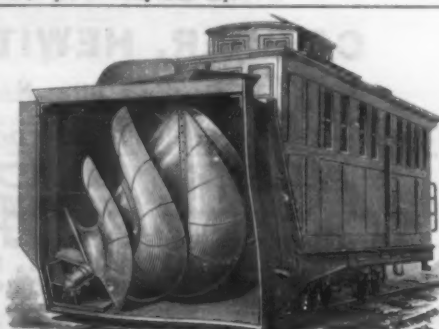
Designers and Builders of Strictly High-Class Locomotive Engines for any required service
Edw'd Nichols Pres. M. L. Hinman, V-Pres. & Treas. T. M. Hequembourg, Sec. R. J. Gross, Agent.
D. Russell, Supt. H. Tandy, Asst. Supt.

JULL CENTRIFUGAL SNOW
EXCAVATOR.

MANUFACTURED BY THE

JULL M'F'G.CO.

189 MONTAGUE ST.
BROOKLYN, N.Y.



KING IRON BRIDGE & MFG. CO

Iron and Steel Bridges, Girders, Turntables, Buildings, Eye Bars,
Elevated Railroads and Structural Work of all kinds.

OFFICE AND WORKS: CLEVELAND, OHIO.

CHICAGO OFFICE: 1105-1107 ROOKERY BLDG.

CAPACITY, 20,000 TONS PER ANNUM

HILTON BRIDGE CONSTRUCTION CO.,

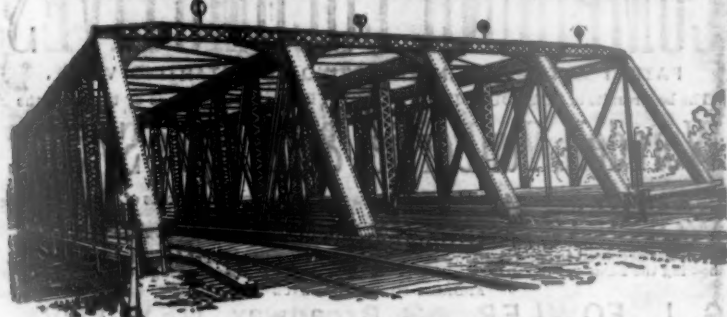
ENGINEERS AND
BUILDERS OF

STEEL AND WROUGHT IRON BRIDGES, ROOFS, &C., ALBANY, N. Y.

BOSTON BRIDGE WORKS

D. H. ANDREWS, Proprietor.

70 KILBY ST., BOSTON, MASS.



DESIGNERS AND BUILDERS OF

Railroad Bridges and Heavy Wrought Iron Structural Work

OF EVERY DESCRIPTION.

SUPERIOR WROUGHT IRON TURNABLES A SPECIALTY.

Works on Grand Junction Railroad.

MO. VALLEY BRIDGE & IRON WORKS

LEAVENWORTH, KAN.

A. J. TULLOCK
Proprietor.

MANUFACTURER AND BUILDER

OF
Wrought Iron, Steel, Howe
Truss and Combination
Bridges, Turn Tables,
Draw Spans, Roof
Trusses, Piers,
Substructures
Foundations,
Etc., Etc.

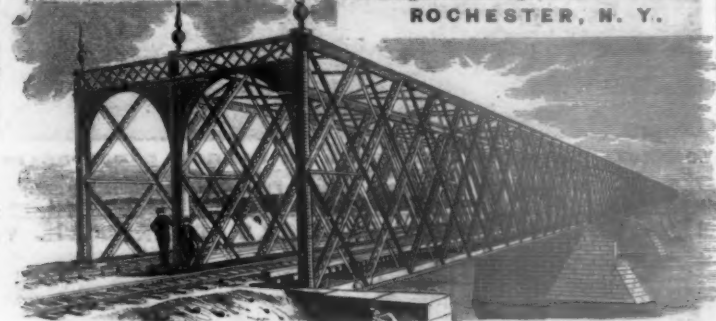


ROCHESTER BRIDGE AND IRON WORKS

J. F. ALDEN,

Successors to Alden & Leasing and Leighton Bridge & Iron Works

ROCHESTER, N. Y.



DESIGNERS AND BUILDERS.

Wrought Iron and Steel Work for Bridges and Buildings.

NEW JERSEY STEEL & IRON CO

TRENTON, N. J.,

BUILDERS OF

BRIDGES, ROOFS, Etc.

COOPER, HEWITT & CO.,

17 Burling Slip, New York.

Plans and Estimates Furnished for Draws, Fixed Spans, Etc.

ALEX. MCCLURE, MANUFACTURER OF LONG PINE BRIDGE TIMBER.

PITTSBURGH, PA.

Capacity, 150,000 Feet Per Day.

2 1/2 all the Year. Can Fill Orders in Winter on Short Notice.

CHAS. KELLOGG, Pres. ROBT. GRIMES, Vice-Pres. WALTER HAWTHURST, Treas. W. S. MCCORD, Secy.

ELMIRA BRIDGE COMPANY,

(LIMITED)

ENGINEERS AND MANUFACTURERS.

Steel & Iron Bridges, Roofs & Turntables

ELMIRA, N. Y.

OFFICE AND WORKS:

Elmira, N. Y.

NEW YORK OFFICE:

18 Broadway.

CHICAGO BRIDGE & IRON CO

443 Rookery Building, CHICAGO, ILL.

Works: 105 & 106 Sts., Rock Island & Panhandle Railroad.

Successors to Kansas City Bridge & Iron Co., Kansas City, Mo.; Horace E. Horton, Rochester, Minn.

MANUFACTURERS OF

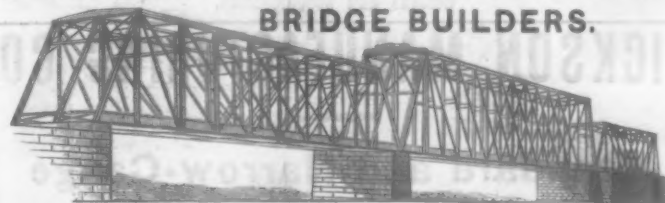
METALS for STRUCTURES.

CONTRACTORS AND BUILDERS

Steel, Iron and Combination Bridges. Masonry and Metal Substructures.

WORKS AT - Passaic Rolling Mill Co. New York Office, Aldrich Court, 45 Broadway

PATERSON, N. J. BRIDGE BUILDERS.



N. Y. Lack. & Western Ry. - Erie Crossing at Buffalo.

Wrought Iron Railroad & Highway Bridges, Turn Tables & Roofs. All made from the best material of our own manufacture. Manufacturers of all kinds of Iron and Iron Work for Bridges and Buildings. Plans and Estimates furnished.

WATTS COOKE, Pres. W. O. FAYERWEATHER, Treas. G. H. BLAKELEY, Chf. Engr

S. W. FRESCOLN,

ENGINEER AND CONTRACTOR,
WORLD BUILDING, NEW YORK CITY,

—DESIGNS AND BUILDS—

Bridges, Viaducts, Iron and Steel Structures, Railroads, Pneumatic Foundations, Harbor Works.

SOOY SMITH & COMPANY

(INCORPORATED),

CONTRACTING ENGINEERS,

Design and build in any part of the country

BRIDGE PIERS, PNEUMATIC CAISSON FOUNDATIONS, TUNNELS.

MARINE PIERS, DOCKS, LIGHTHOUSES,

AND ALL KINDS OF ENGINEERING CONSTRUCTIONS.

THE FREEZING METHOD

Now in use by us, and for which we control the American Patents, makes the construction subsequent tunnels, deep foundations, shafts, etc., practicable in soft or water-bearing ground and to depths hitherto unattainable.

Main Office, - - No. 9 NASSAU STREET, NEW YORK.



DETROIT BRIDGE & IRON WORKS

ENGINEERS &

BRIDGE BUILDERS

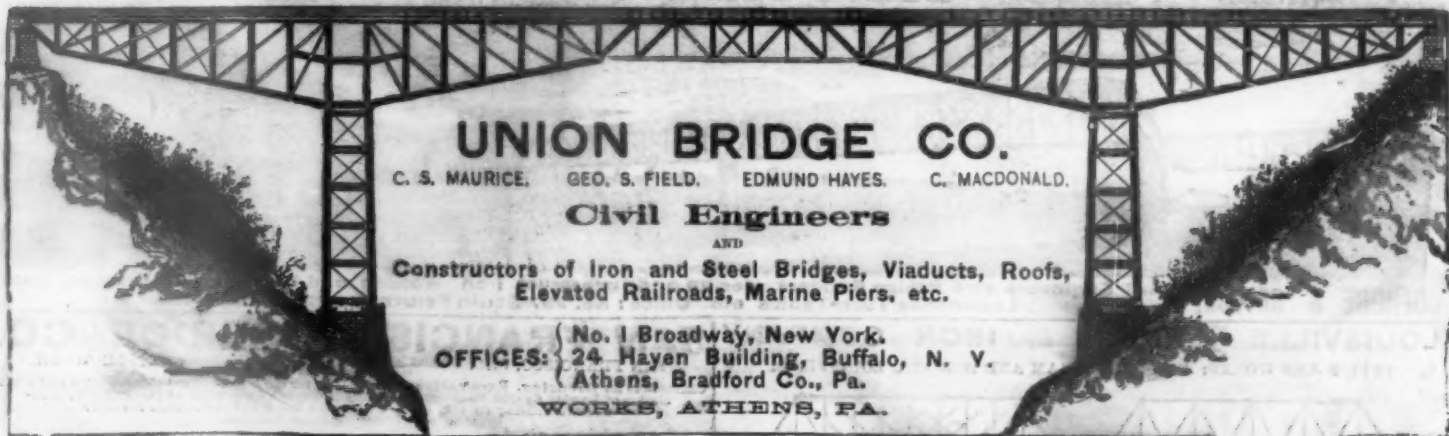
DETROIT

MICH.

STEEL, IRON AND COMBINATION
BRIDGES, ROOFS, VIADUCTS, TURNABLES

STANDARD DRAWINGS, on Card Board, Car Axle Journal-bearing; Journal and
Federal, Price, 50 cents each.

THE RAILROAD GAZETTE, 17 BROADWAY, NEW YORK.



UNION BRIDGE CO.
 C. S. MAURICE. GEO. S. FIELD. EDMUND HAYES. C. MACDONALD.
Civil Engineers
 AND
 Constructors of Iron and Steel Bridges, Viaducts, Roofs,
 Elevated Railroads, Marine Piers, etc.
 OFFICES: { No. 1 Broadway, New York.
 { 24 Hayen Building, Buffalo, N. Y.
 { Athens, Bradford Co., Pa.
 WORKS, ATHENS, PA.



J. F. ANDERSON. **ANDERSON & BARR** C. C. BART.
 ENGINEERS AND CONTRACTORS.
 Address 240 Eleventh Street, Jersey City.
 ATCHAFALAYA BRIDGE, TEXAS PACIFIC RAILWAY
 Pneumatic Work, Deep Foundations and Tunneling in Soft Materials Specialties.
 Control the Patents for the Automatic Dredge and the Anderson System of Tunneling.

THE PHOENIX BRIDGE CO. **PHOENIXVILLE BRIDGE WORKS**
 Successors to Clarke, Meves & Co. ENGINEERS AND BUILDERS OF
 Bridges, Viaducts, Roofs, Turn-Tables, Etc.
 SPECIALTIES: Accurate Workmanship; the use of Double-Refined Iron; no welds; Phoenix Upper-chords and Posts; the best form of Strut.
 ALL WORK DONE ON THE PREMISES - FROM ORE TO FINISHED BRIDGES.
 ILLUSTRATED ALBUM Mailed on receipt of \$3.00.
 DAVID REEVER, President. ADOLPHUS BONZANO, Vice-Pres. and Chief Eng'r. WILLIAM H. REEVER, Gen. Supt. FRANK T. DAVIS, Treasurer.

A. & P. ROBERTS & COMPANY.
PENCOYD IRON WORKS **PENCOYD BRIDGE & CONSTRUCTION COMPANY**
 MANUFACTURERS OF DESIGNERS AND MANUFACTURERS OF
 Wrought Iron and Open Hearth Steel, BRIDGES, VIADUCTS, TURN TABLES, Etc.
 OFFICE: 301 S. 4th Street, PHILADELPHIA, Pa. WORKS, PENCOYD, PA.

THE POTTSVILLE BRIDGE COMPANY,
 DESIGNERS AND BUILDERS OF
BRIDGES, VIADUCTS, ROOFS, ETC.
 Office: No. 226 South Fourth Street, Philadelphia, Pa. Works: Pottsville, Pa.

KEYSTONE BRIDGE CO.
 GENERAL OFFICE AND WORKS, PITTSBURGH, PA.
 WESTERN OFFICE, 205 LA SALLE ST., CHICAGO, ILL. EASTERN OFFICE, 46 WALL ST., NEW YORK.

EDGE MOOR BRIDGE WORKS
 OFFICE AND WORKS, EDGE MOOR, DELAWARE.

SHIFFLER BRIDGE COMPANY,
 DESIGNERS AND MANUFACTURERS OF
 Railway Bridges, Viaducts, Train Sheds, Girders, Roof Trusses, Iron Buildings, Etc.
 Office and Works: 48th STREET and A. V. R. R., PITTSBURGH, PA.

THE PITTSBURGH BRIDGE CO.
 WESTERN OFFICE: 1105 OWINGS BUILDING, CHICAGO.
 W. W. CURTIS, Western Representative.

THE YOUNGSTOWN BRIDGE CO.
 MANUFACTURERS OF **IRON & STEEL BRIDGES**
 IRON STRUCTURAL WORK YOUNGSTOWN, O.
 Times Bldg. Pres. U. L. Coates & Co. B. F. Davis & Co.

R. A. SHAILER. C. R. SCHNIGLAU.
SHAILER & SCHNIGLAU,
 Successors to W. G. COOLIDGE & CO.,
 Engineers and Contractors,
 DESIGNERS AND BUILDERS OF
 BRIDGES, BUILDINGS AND SUBSTRUCTURES.
 609, 610 & 611 Phenix Building, 139 Jackson St., Chicago, Ill.
 SCALES FOR TURNOUTS. By E. A. CHESLER. Gives graphically the frog number length of lead and degree of curvature for turnouts from 3° to 42° 30'. Stiff card board, pocket size. More convenient and certain than tables. Price, with full directions for use, 25¢. THE RAILROAD GAZETTE, 75 BROADWAY, N.Y.

THE PHILADELPHIA BRIDGE WORKS.

JOSEPH H. COFRODE.

OHIO RIVER BRIDGE AT BEAVER, PA.—CHANNEL SPAN 440 FEET.

FRANCIS H. SAYLOR.



COFRODE & SAYLOR, Civil Engineers and Bridge Builders, design and construct Iron Wooden and Combination Bridges, Roofs Locomotive Turn-Tables etc. Office: No. 257 South Fourth Street, Philadelphia.

LOUISVILLE BRIDGE & IRON COMPANY

OFFICE AND WORKS: CORNER OLDHAM AND 11TH STS., LOUISVILLE.



TRIANGULAR, WHIPPLE AND FINK TRUSSES.

and other forms of Iron and Combination Bridges. Also Manufacturers of Iron Roofs, Turn Tables, Frogs, Switches, etc.

J. M. JOHNSON, Pres. & Engr. E. BENJAMIN, Vice-Pres. F. H. VAUGHAN, Sec. & Treas.

THE MT. VERNON BRIDGE CO.,

IRON & STEEL BRIDGES, BUILDINGS, ETC.

MT. VERNON, O.

New Revised Edition of

CAR-BUILDERS' DICTIONARY,

Price, \$3 a copy.

THE WALLIS IRON WORKS.

Iron Buildings, Bridges, Turntables, Roofs and Riveted Girders

SOLE MANUFACTURERS OF THE PERKIN'S PATENT SHUTTERS.

Main office and works: 7, 9, 11, 12, 15 Morris and 7 and 9 Essex Sts. Telephone, 38. JERSEY CITY, N. J. NEW YORK OFFICE, 95 LIBERTY STREET.

CREOSOTED MATERIAL.

THE CREOSOTE LUMBER & CONSTRUCTION CO., OF FERNANDINA, FLA.

Furnishes CREOSOTED MATERIAL of all kinds by the cargo and carload. Manufacturers of WOOD CREOSOTE OIL, the only oil used at their works in protecting timber against decay and the ravages of the sea worms. Shipping facilities unsurpassed by rail and water. Write for circular and prices. B. T. BURCHARDI, Chief Engineer and Superintendent.

CHAS. M. JARVIS, Pres. & Chf. Engr.

BURR K. FIELD, Vice-Pres.

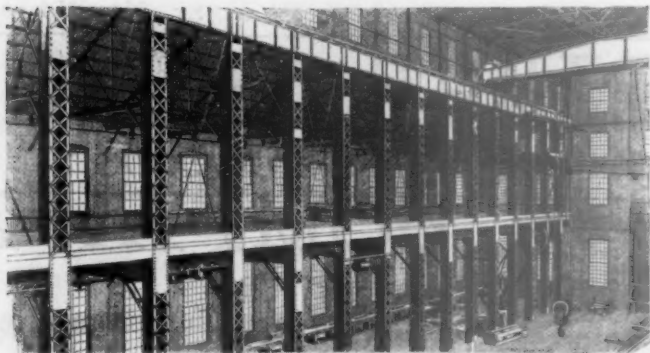
FRANK L. WILCOX, Treas.

GEO. H. SAGE, Secy.

THE

BERLIN IRON BRIDGE CO.,

EAST BERLIN, CONN.



The above illustration shows an interior view of the Machine Shop designed and built by us for the Newport News Shipbuilding and Dry Dock Co., at Newport News, Va. The photograph was taken looking diagonally across the Machine Shop into the gallery floor, and shows the first and second floors in the leanto and the traveling crane in the main portion of the Machine Shop. The building is 100 ft. in width by 300 ft. in length, the central portion being 50 ft. in width, with a wing on each side two stories high, 25 ft. in width. The floor space in the central portion of the building is served by a hydraulic crane, as shown in the above illustration.

SEND FOR ILLUSTRATED CATALOGUE.

OFFICE AND WORKS:

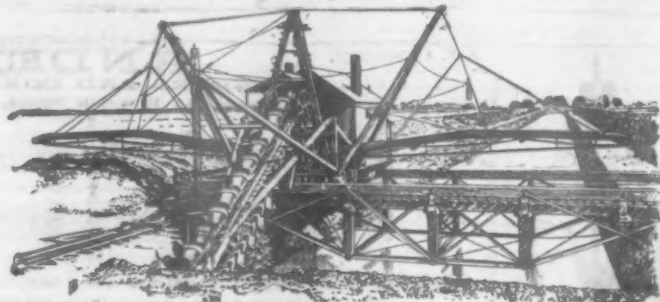
No. 1 RAILROAD AVE., EAST BERLIN, CONN.

SAN FRANCISCO BRIDGE CO.

SAN FRANCISCO, CAL.

SEATTLE, WASH.

Contractors for Dredging, Excavation and Filling for the Improvement of Navigation and Reclamation of Lands. Special Machinery for the Economical Excavation of Large Canals. Contractors bidding on this kind of work will find it to their interest to confer with us. Correspondence solicited.



Excavator for digging canals, deepening rivers, building levees or embankments. Now digging canal in Colusa County, California, 6 miles long, 30 ft. deep and 100 ft. wide. Can be mounted on car and bridge, or on barge; weight, 300 tons; cost, \$60,000; capacity, 100,000 cu. yds. per month. Built under Letters Patent of Dec. 23, 1890; May 4, 1886, and Sept. 9, 1890.



SOLE MANUFACTURERS OF FRED C. WEIR'S IMPROVED RIGID & SPRING FROGS, CROSSINGS, SINGLE & THREE THROW SPLIT SWITCHES, FIXED & AUTOMATIC SWITCH STANDS, STEEL DIE FORMED RAIL BRACES, SWITCH FIXTURES, ETC.

CABLE & ELECTRIC TRACK WORK FROGS, SWITCHES, CROSSINGS, CURVES, RAIL CHAIRS, ETC.

SAMUEL LEES, President.

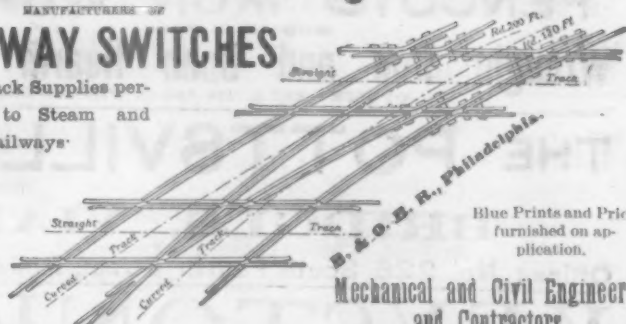
EDWARD H. JOHNSTON, General Manager.

AMOS GARTSIDE, Treasurer.

Johnston Railroad Frog & Switch Co.

RAILWAY SWITCHES

All Track Supplies pertaining to Steam and Street Railways.



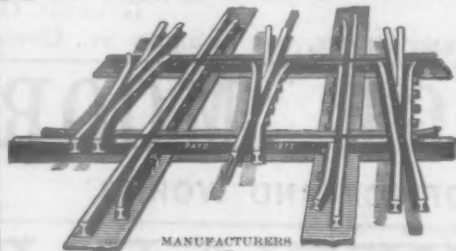
Blue Prints and Price furnished on application.

Mechanical and Civil Engineers and Contractors.

OFFICE AND WORKS, CHESTER, PA.

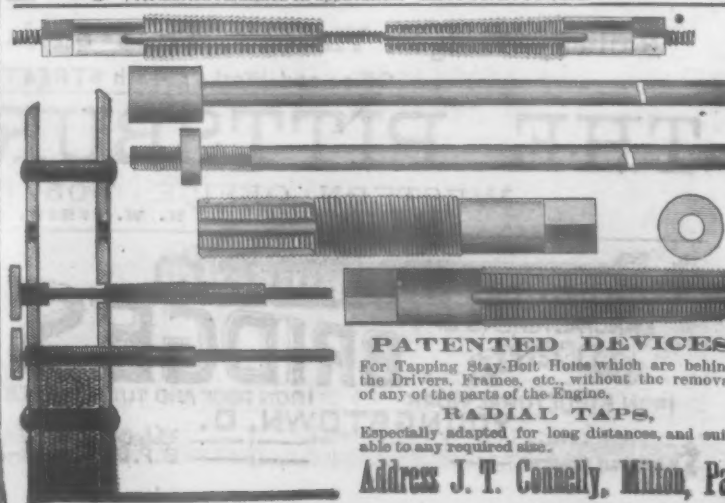
ELLIOT FROG & SWITCH CO.

RIGID FROGS. LAP SWITCHES. Rails of any Weight or Section Desired Carried in Stock.



Wrought Iron Head Chairs, Rail Braces, Bridge Rods and every description of Railroad Iron Work. Catalogue and other information furnished on application. EAST ST. LOUIS, ILL.

SPRING RAIL FROGS. SPLIT SWITCHES. AUTOMATIC SWITCH STANDS.



PATENTED DEVICES. For Tapping Stay-Bolt Holes which are behind the Drivers, Frames, etc., without the removal of any of the parts of the Engine.

RADIAL TAPS.

Especially adapted for long distances, and suitable to any required size.

Address J. T. Connelly, Milton, Pa.

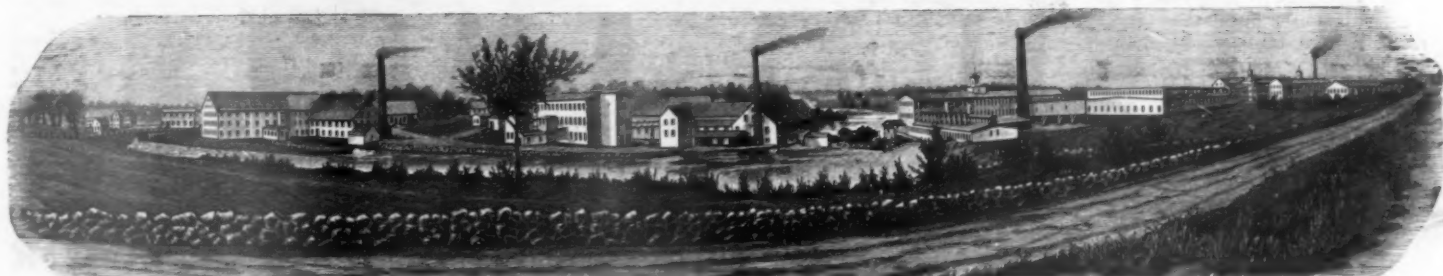


ow
be
da.
RIC
RK
IES
VES
RS
0.
K
Price
ap-
cers
AUTOMATIC SWITCH STANDS.
CES.
behind
removal
and suit-
Pa

SANFORD MILLS,

MANUFACTURERS OF

CAR PLUSHES.



WE CLAIM FOR OUR CAR PLUSHES:

1. SUPERIORITY IN QUALITY AND FINISH TO ANY FOREIGN GOODS.
2. MORE DURABILITY IN COLORS THAN FOREIGN, AS DEMONSTRATED BY ACTUAL TESTS.
3. THAT THE ABOVE ARE FACTS IS PROVED BY THE CONTINUED SUPPORT OF THE BEST CAR-BUILDERS IN THE COUNTRY.

WE CAN FURNISH ANY COLOR OR SHADE DESIRED.

L. C. CHASE & CO., Selling Agents, 129 Washington St., Boston, Mass.

338 BROADWAY, NEW YORK.

260 FIFTH AVENUE, CHICAGO.

BEALS RAILWAY BRAKE CO

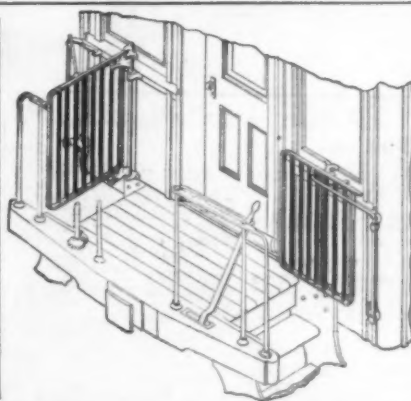
LOCOMOTIVE BRAKES,

53 BROADWAY, NEW YORK.

The Only Brake that can Cover All the Wheels
of a Locomotive, including the
ENGINE TRUCK.

TESTS OF THE BEALS ENGINE BRAKE

COMPARED WITH		operated by Westinghouse	
Test of American Pull Brake (best results obtained at Burlington)	Automatic Air on Consolidation Engine:	Speed.	Distance to stop (feet)
		M. P. H.	
American Pull Brake (Consolidation Engine).....		20	376
Beals Engine Brake (Ton-wheeled Engine).....		30	167
DIFFERENCE IN FAVOR OF BEALS BRAKE.....			109 FT



WOOD'S CAR PLATFORM GATE

SHOULD BE SPECIFIED

On all Cars Designed for World's
Fair or other Passenger Traffic.

4,000 NOW IN USE.

J. B. GOODWIN,
SOLE AGENT,
29 Broadway, Room 182,
NEW YORK.

THE DE LA VERGNE REFRIGERATING MACHINE COMPANY

Office and Works: Foot of East 138th St. (Port Morris), New York City.

MANUFACTURERS OF

REFRIGERATING AND ICE-MAKING MACHINES

AND OF

ANHYDROUS AMMONIA for the Same.

About 400 Machines now in successful operation, some of them representing the largest machines ever built. Total Capacity about 20,000 Tons of Ice Per Day.
Send for either Refrigerating or Ice Making Circulars.

D. A. HOPKINS MFG. CO. LEAD-LINED JOURNAL BEARINGS AND BRASS CASTINGS.

CENTRAL BUILDING, 143 LIBERTY ST., N. Y.

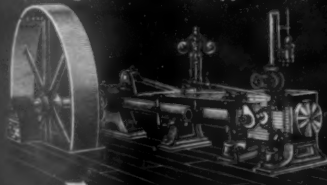
PHILADELPHIA CORLISS ENGINES.

Catalogues Mailed on Application.

Non-
Condensing.
Condensing.

Triple
and Quadruple
Expansion.

Horizontal or
Vertical.



Superior
Design.
Workmanship
and Finish.

Best Material.
HIGHEST
EFFICIENCY
GUARANTEED.

PHILADELPHIA ENGINEERING WORKS LTD.
MIFELIN ST. EAST OF FRONT ST. PHILADELPHIA, PA.



High Economy, Noiseless Operation, Close Regulation.

HENRY D. LAUGHLIN, Pres.
E. A. LEIGH, V. P. and Gen'l Mgr.
A. J. FARLEY, Secy.
L. C. BURGESS, Supt.
GENERAL OFFICE AND WORKS:
40th and Hopkins St., Chicago.
CITY OFFICE:
514 Phenix Building, Chicago.
NEW YORK OFFICE:
Room 118, 29 Broadway.
FREDK G. ELY, Eastern Agent.



A Perfectly Constructed
Metal Brake Beam.

The Cheapest, Lightest and most Durable.

Now Standard on a large number of roads throughout the country.

Correspondence Solicited.

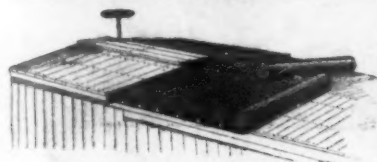
The Best Rail Fastening in the World for the Money!

THE GOLDIE PERFECT RAILROAD SPIKE IN SOFT STEEL

DILWORTH, PORTER & CO., Ltd., Pittsburgh, Pa.,

Or { C. H. MECUM, 213 Phenix Bldg., Chicago. } AGENTS { H. C. McNAIR, St. Paul. }
{ M. M. BUCK & CO., St. Louis. } { C. M. NOYES, Milwaukee. }

THE HUTCHINS FREIGHT CAR ROOF.



This roof has been in extensive use for over twelve years. It is strong, durable and attractive in appearance and costs less than a grooved board roof.
In repairing old cars, the under course of boards can always be utilized—a great saving—making it the cheapest and best roof for repair work in the market. This roof is standard on a large number of leading railroads in the country. Send for Pamphlet and Blue Print.

C. B. HUTCHINS & SONS, DETROIT, MICH.
Chicago Office: 904 "The Rookery."

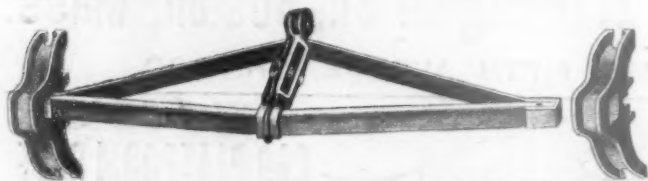
"Machined" Car Wheels.

600,000 Made under our
SYSTEM OF COMPARATIVE TESTS
Without one case of breakage in service.

We contract to regrind our wheels at points of removal, saving freight and increasing total life of wheels from 100 to 300 per cent.

NEW YORK CAR WHEEL WORKS, BUFFALO, N. Y.
P. H. GRIFFIN, Pres., BUFFALO, N. Y. J. R. ELLICOTT, Gen. Agt., 115 Broadway, N. Y.

"KEWANEE" RECTANGULAR BRAKE BEAM.



MEETS ALL M. C. R. REQUIREMENTS, AND HAS
Hollow Rectangular Compression Member,
Maximum Stiffness Under Vertical Load,
MANUFACTURED BY No Nuts or Bolts.
NORTHWESTERN EQUIPMENT COMPANY, "The Rookery," CHICAGO, ILL.
EDWARD I. FROST, Sec'y and Manager.

THE MOST DESIRABLE



OF
Librarian of Congress
Velocipede
31 Dec 92
Hand Car.



Manufactured in Four Different Patterns.
CORRESPONDENCE SOLICITED.

SHEFFIELD VELOCIPEDE CAR COMPANY, Three Rivers, Mich.

STEEL
CASTINGS

True to Pattern, sound, solid, free from blow-holes, and of great strength.
Stronger and more durable than iron forgings in any position or for any service whatever.
20,000 Knuckles for M. C. R. Standard Car Couplers.
60,000 CRANK SHAFTS and 50,000 GEAR WHEELS of this steel now running prove this.
Cross Heads, Rockers, Piston Heads, etc., for Locomotives. STEEL CASTINGS of every description.
Send for Circulars and Prices to
CHESTER STEEL CASTINGS CO.
Works, Chester, Pa. Office, 407 Liberty St., Philadelphia, Pa.

STEEL CASTINGS

PRATT & LETCHWORTH
PROPRIETORS.
BUFFALO STEEL FOUNDRY,
Buffalo, N. Y.

CRANES

OF ALL TYPES.
Particulars
on Application

THE YALE & TOWNE MFG CO., Stamford Conn.
NEW YORK. CHICAGO. PHILADELPHIA. BOSTON.

SLOTTING MACHINE 13 Inch Stroke

A SIMPLE, POWERFUL AND EFFICIENT TOOL,
SOLD AT A LOW PRICE.

Send for particulars to the Newark Machine Tool Works,
NEWARK, N. J.

MAGNETO ALARM SIGNAL, FOR HIGHWAY CROSSINGS

EFFICIENTLY AND ACCEPTABLY PROTECTS THE PUBLIC FROM ACCIDENT
By an unmistakable warning of the approach of every train, of such vigor and emphasis as to arouse the attention of the most unwary. Gives no false alarms. Obviates employment of watchmen at the majority of crossings, at a great saving in expenditure.

MAKES ITS OWN ELECTRICITY
Only as required, by passage of train over track levers of substantial Magneto Generators in strong iron cases alongside the tracks at required distance from crossing. No cup batteries are used. No freezing in winter. No failure of power. Requires only lubrication, and a little attention to working parts, at intervals.



READY AT ALL HOURS.
Action incomparably better, quicker and louder than any other electric signal. No other signal has the advantage of Magneto Generators with only alternate currents, having no commutators, and constantly in circuit, with no springs or weights in striking apparatus. Furnished on approval to roads wanting to test.

Manufactured by PENNSYLVANIA STEEL CO., Steelton, Pa.

STEEL RAILS of all patterns, Steel Forgings, Billets and Bars, Steel Rail FROGS, Crossings, Split Switches, Safety Switches, Switch Stands, Switch Fixtures, Etc.

NEW "88" MONITOR INJECTOR

CUT OF "88" MONITOR.

FOR LOCOMOTIVES

"NATHAN"

Sight Feed Lubricators,

For Locomotive Cylinders and Air Brakes.

STEAM FIRE EXTINGUISHERS
For Switching and Yard Engines.

BOILER WASHERS
Rod and Guide Oil Cups, etc.

NATHAN MFG. CO.

92 & 94 Liberty St., New York.

SEND FOR DESCRIPTIVE CATALOGUE.



GENERAL
RAILROAD PRINTING
AND STATIONERY SUPPLIES.

W. H. CAMPBELL
DUPLIX
TICKETS
SPECIALTY
NEW YORK

23 UNION SQUARE

TWENTY YEARS EXPERIENCE. CAN REFER TO MORE THAN TWO HUNDRED LINES. ORDERS MAY SAFELY BE SENT BY WIRE WHEN NECESSARY AND WILL RECEIVE IMMEDIATE PERSONAL ATTENTION. ALL WORK AND STOCK GUARANTEED FIRST CLASS OR NO CHARGE.
SAMPLES AND PRICES FURNISHED OFFICIALS ONLY.

SHARON STEEL CASTING CO.,
SHARON, PA.
OPEN HEARTH STEEL CASTINGS,
Equal to Forgings.
RAILROAD WORK A SPECIALTY. SEND FOR PRICES.

DELAWARE, LACKAWANNA & WESTERN R. R. CO.,
MORRIS & ESSEX SHOPS,
DOVER, N. J., Dec. 28, 1891.

KNITTED MATTRESS CO., Canton Junction, Mass.

Sirs: We have been using your padding for coach seats and backs during the past five years. Have it now in about 45 to 50 coaches.

Consider it equally as good, and in some respects better than curled hair, just as durable, gives us a better shape and a more comfortable seat than curled hair, with a saving of about \$80 to each car.

Yours, etc.,
(Signed) J. W. BAKER, M. C. B.

BRADLEY CAR WORKS, WORCESTER, MASS.

ESTABLISHED 1833.

MANUFACTURERS OF EVERY DESCRIPTION OF

RAILWAY CARS.

OSGOOD BRADLEY & SONS, Proprietors.

GATES ROCK AND ORE BREAKER.

GATES IRON WORKS, 50a S. Clinton St., CHICAGO. 73a Queen Victoria Street, London. 44 Dey Street, New York.